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EDITORIAL

A TRIBUTE TO MAX NEUBURGER ON THE OCCASION OF HIS 75TH BIRTHDAY DECEMBER 8, 1943

Dear Professor Neuburger, our Venerated Master:

How time flies! Fifteen years ago, in 1928, I had the honor to address you on the occasion of your 60th birthday. Students and friends had come to Vienna and had assembled in the Josephinum, in the Institute of the History of Medicine that you had built, literally, with your own hands. We had come to present you with a *Festschrift* and to express our gratitude and admiration.

Vienna was no longer the imperial city of pre-war days, with a glittering court, with archdukes and sweet girls, with light-hearted operettas and great misery at the bottom. The war had left a deep scar on the city and everyone was impoverished. I remember how you had to carry on your work and administer your department with practically no budget at all. And yet, there was hope. New creative forces were at work. One day your colleague, Professor Tandler, who combined the chair of anatomy with social work in the city council, took me out and showed me the Karl Marx Hof and other

beautiful new housing units built for the workers of Vienna; showed me the new nurseries, kindergartens, health centers and other social welfare institutions. Vienna, once one of the socially most backward cities, was moving rapidly to the front and was setting an example to other towns. There was hope, and in that year 1928 it looked on the surface as if Vienna was recovering rapidly. But students of history like you and me, who were trained to look under the surface and to take the long view of things, could not have much confidence in the future. Only too well did we realize how artificial the whole structure of Europe was in those days, a large body with feet of clay.

And then, five years ago, in 1938—five years only but they seem an eternity—we intended to celebrate your 70th birthday in an elaborate way. Again we had prepared a *Festschrift*. A medal with your portrait was to be issued. The XIth International Congress of the History of Medicine was to be held in Yugoslavia. You were to be the guest of honor, the pivot of the convention. Alas, at that time already our most pessimistic expectations had become true. The world war was already raging on three fronts, in the Far East, in Africa, and in Spain. Vienna was in the grip of the brown pest, a plague infinitely more devastating than the Black Death of the 14th century because it not only killed human lives but attempted to destroy the dignity of man. You were not permitted to join us, and all that we in Yugoslavia at that time could do was to elect you an honorary member of the International Society of the History of Medicine, in spite of everything.

The events of the last five years need not be recalled in detail. The wound is bleeding still. When the world war spread to Western Europe, you like Sigmund Freud and so many distinguished Austrians were forced into exile. We were happy to hear that the Wellcome Medical Historical Museum had offered you an asylum. London was not a very safe place at that time but it was the capital of a country that respected human dignity, and the Museum gave you an opportunity to continue your work.

You have had a hard life. A trained neurologist, a member of the great Vienna School, it would have been so easy for you to have

made money by catering to the international clientele that filled the Vienna clinics. But you were a scholar, and you could not but choose the thorny path of learning. Medical history at that time was not yet a fully established subject in the universities. Stipends were small and whoever embarked upon such a career knew that he would have to struggle against many difficulties.

Great monographs came from your pen. They revealed profound historical understanding and a broad philosophical outlook. Most medical historians at that time were philologists, interested in texts and engaged in analytical work. Your mind was bent on synthesis. You did not edit texts but you wrote history, and you did it in a brilliant style which makes the reading of your books so captivating.

It was obvious that a man of your ability and disposition would attempt to write the book for which the medical world had been waiting for almost a century, a comprehensive *History of Medicine*. There were many good short books available, but since Kurt Sprengel no one had dared to present the history of medicine in detail. You made a brave start and the two volumes published in 1906 and 1911 covering antiquity and the middle ages showed that you and no one else could do the job. They gave inspiration and guidance to a whole generation of students of medical history, and I for one can testify how much they meant to us. They gave us not only facts but a philosophy of medicine. In your hands medical history evolved from being an antiquarian subject to be a vital matter full of significance for our day.

We shall always deeply deplore that you did not complete the work. I know that the last war affected you greatly. A cord was broken in you. I met you for the first time in Vienna soon after the war and I remember well how you felt. I can sympathize with you probably more than anybody else because the present war has destroyed my own hopes and plans. But we must not become bitter. It was our lot to live in a great period of transition, through the agony of a world that is dying of its own rottenness but also through the birthpains of a new world that must and will be better. Already we can perceive the dawn of a new day. As historians we live in full consciousness of developments and it is given to us to look at the

world objectively as if from another planet, disregarding our own personal fate. I think we must be grateful for the privilege of having been witnesses of one of the most decisive periods of the world's history. The book that you undertook and that I planned to write, will be written someday by somebody else. It must be our satisfaction to know that we have paved the way for it, that it will perhaps be closer to the truth on account of the work we did.

In the period between the two wars you became the great historian of Viennese medicine. It was not local history that you wrote because three times, in the 18th, 19th and again in the 20th century Vienna was a world center of medicine. In a series of monographs and papers you revived the Viennese Schools, recreated the atmosphere in which they developed and gave brilliant portraits of the leading personalities. And when the time of exile came, you kept Vienna in your heart and looked at it from outside. In spite of manifold handicaps you never interrupted your work. You now studied the relations between Viennese medicine and that of other countries particularly England, the country that had given you an asylum.

It was not easy to hold a leading position in medical history in a German-speaking university at the time of Karl Sudhoff. His domineering and aggressive personality tolerated disciples but not competitors, and he was often unfair to you. But to the students of my generation it meant a great deal to have two men like you, leaders both and yet as different as they could be: Sudhoff, the philologist engaged in analytic work; you, the philosopher bent on synthesis. You supplemented each other in an ideal way and it is a great pity that Sudhoff's attitude made it impossible for you to work together. As a close student of Sudhoff I wish to testify how much I owe to you, to your writings that I studied and digested, and to the warm interest that you always showed for my work from the first days of my career. The circle of your immediate students was not large, but they came from many lands and through your writings you extended your teaching all over the world. There is not a medical historian today that you may not claim as your student.

Let us hope that we may celebrate your 80th birthday in Vienna, in a Vienna liberated and reborn, a people's Vienna. In its people

Vienna and Austria at large possess an inexhaustible reservoir of talent and genius. A farrier and cartwright produced Haydn, a school-teacher Schubert, Auenbrugger was the son of an innkeeper. From the people has come all that has made Austria great and beloved in the world. Vienna's working people, ready to rise today, will purge the country of the pest and will create the conditions for a new flowering of Austrian culture.

Let us hope that we may see that day and in the meantime, dear Professor Neuburger, accept the warmest wishes *ad multos et feliciores annos* from your devoted student and admirer

HENRY E. SIGERIST.

Fig 1.

Professor Max Neuburger in 1937.

PROFESSOR MAX NEUBURGER

A Biography and Bibliography
of the Master of Medical History Professor Neuburger
in Honor of his Seventy-Fifth Birthday on December 8, 1943.

SOLOMON R. KAGAN

Max Neuburger was born at Vienna, Austria, on December 8, 1868, an offspring of two old German-Jewish families of Munich and Hamburg. His education was typical of the later decades of the nineteenth century, and consisted of a preponderance of classical education with little recognition of the value of recreation. After passing the examinations in the elementary school in his native town, he became a pupil in one of the sternest gymnasiums, the so-called *Piaristengymnasium*. He studied there from 1879 to 1887 and acquired his basic knowledge of Latin, Greek and German literature; and last but not least history. In the school he attended there was a martinet, a clergyman and author of several historical publications, Dr. Carl Haselbach, who taught history particularly to the higher classes. Mastery of textbook was not sufficient for passing the examinations; the pupils had to know the opinions and views of the most famous German historians, like Schlosser and Ranke. As a rule, many pupils failed on the examinations. Consequently, Neuburger had to study history nearly four hours daily. It can be stated that the influence of this teacher laid the basis for Neuburger's interest in history. In addition, he acquired a thorough knowledge of the elements of logic, psychology and history of philosophy. At the age of seventeen he started to study privately the work of Spinoza and other great philosophers. In October 1887 Neuburger entered the University of Vienna as a medical student and attended not only the many prescribed lectures at the medical faculty but also introductory lectures at the philosophical faculty dealing with history of philosophy.

Among the teachers in these glorious days of the Vienna medical school were Billroth, v. Brücke, Bamberger, Nothnagel, Meynert, Krafft-Ebing and Stricker; ophthalmology was represented by Fuchs,

otology by Politzer, neurology by Benedict, obstetrics by v. Braun, hydrotherapy by Winternitz,—all men of world-renown. Neuburger, in addition to all mentioned lectures, did not fail to attend the lectures of Theodor Puschmann, professor of the history of medicine. The combination of his studies in general medical subjects and the history of medicine and philosophy was of great significance for Neuburger's scientific evolution and is reflected in his writings which he published as a student. His first article, " Philosophy and Physician," published in 1892, and his chief work *History of Medicine* (1906-11) are characteristic of the man and are the product of his encyclopedic training.

On March 10, 1893, Neuburger was graduated in medicine from the University of Vienna. While occupying various positions as a physician, he continued to study history and philosophy, and it was Professor Puschmann who stimulated him to work on medico-historical subjects. Several of Neuburger's early articles, published in the leading medical journals, attracted wide attention. His monograph dealing with the historical development of the experimental physiology of the brain and spinal cord (1897) was a pioneer work, and was highly praised by Julius Pagel and some eminent neurologists as a classic work.

After receiving his degree of Doctor of Medicine, Neuburger was appointed resident (*Secundärarzt*) at the Hospital Rudolfstiftung in Vienna where he worked for two years (1893-95). From 1896 to 1904 he served as assistant at the neurological department of the *Allgemeine Poliklinik* under the leadership of Professor Moriz Benedict, who by means of his criticism exerted a greater influence on Neuburger than did any other medical teacher. At the age of twenty-nine, on March 17, 1898, Neuburger became *Privatdozent* of medical history at his alma mater. This appointment was given to him under the recommendation of Professor Puschmann to the ministry of education. Neuburger's name became popular and he was invited to deliver lectures at various medico-historical congresses. As early as 1894 he delivered a lecture to the Congress of German Naturalists and Physicians, held in Vienna, on a newly discovered Papyrus of the British Museum (Papyrus Kenyon). In 1900 his book, *Die Anschauungen über den Mechanismus der spezifischen Ernährung,*

was published, which attracted great attention. In 1901 he delivered two lectures at the Congress of the German Naturalists and Physicians, held in Hamburg, on the early history of the antitoxic therapy and on Swedenborg's anticipations in the studies of the functions of the brain. At this Congress Sudhoff, Pagel, Peypers, Stieda and other outstanding men of science were among the listeners, and the young research worker Neuburger gained acknowledgment and reputation. He was then chosen as associate editor with Pagel of the *Handbuch der Geschichte der Medizin*, which was founded by Puschmann. Neuburger's contribution to this monumental work was his comprehensive Introduction to the Renaissance and Modern Medicine (152 pages) which has been frequently quoted by numerous medico-historians the world over. In 1904 under the recommendation of Sudhoff he was nominated extraordinary professor of the history of medicine at the University of Vienna as a successor to Professor Puschmann. Then successively he became *Titular-ordinarius* in 1912, and *ordentlicher Professor* in 1917, which position he held until 1934. Afterward as pensioner he became honorary professor and was requested by the ministry of education to continue his occupation as lecturer and as leader of the historical and medical museum at the Vienna University.

Until the year of 1914 Neuburger practised as a neurologist. During the World War I he served in the Austrian army as *landsturmpflichtiger Zivilarzt* (1914-18). In 1917 he received the degree of Doctor of Philosophy from the University of Vienna after presenting his thesis.

In appearance one may describe Neuburger as the typical old-fashioned professor, courtly in manner, with a drooping mustache, rather long hair, and somewhat antiquated clothes. He is a prolific correspondent and through his letters he became acquainted with many famous men. He donated his collection of about 300 letters to the Institute of Medical History at Vienna. Among them are letters or cards from Baas, Puschmann, Sudhoff, Singer, Sir D'Arcy Power, Sir William Osler, Garrison, Cushing, Cordell, Walsh, Fulton, Wickersheimer, Tesdorf, Meyerhof, Proksch, Ebstein, Kousis, van Andel, Hult, Johnson, de Lint, Gomoiu, Bier, Müller, v. Kern, v. Eiselsberg, Oebersteiner, Exner, Newman, Oppenheim, v. Erb,

Retzius, v. Gross, Politzer, Maggiora, Martinotti, Castiglioni, v. Pirquet, Comenge, and Ulecia.

Neuburger's achievements are threefold. He accomplished much as a research worker and author of many medico-historical publications, as a teacher of history of medicine, and as the founder of the Institute and Historical Medical Museum at the University of Vienna.

Neuburger has made substantial contributions to medical history. Many of the publications are remarkable for their scholarly and accurate content, and a number of them are pioneer work. He is not merely a chronicler of facts, but also he is an interpreter of historical events and persons. He emphasizes the philosophical aspects of medical history and shows the development of medical thoughts and the dependence of the medical methods upon the leading general ideas in each historical period. He considers medicine as an important part of the culture in general in connection with the *Zeitgeist*, i. e. with the spirit of the time, with the philosophy, science, technic and art of the epoch. In his opus magnum *History of Medicine* he shows that the medical thoughts and problems of the different ages are always dependent on the dominant basic ideas, and that philosophy, science, medicine, arts, and allied subjects are manifestations of fundamental ideas. He wrote as follows:

> Künstlerische und wissenschaftliche, soziale und politische Verhältnisse einer Zeitepoche sind nur verschiedene Manifestationen desselben Urphänomens, ähnlich den Einzelstimmen einer Fuge, die nacheinander dasselbe Thema ergreifen, bis es zum dominierenden Grundgedanken wird.[1]

In this sense Neuburger wrote the history of medicine as the history of thought, as the evolution of chief ideas. Sudhoff, Singer, Garrison and Hemmeter have designated Neuburger as the greatest philosophic medical historian.

The best description of Neuburger as a medico-historian was given by Dr. Fielding H. Garrison who wrote:

> As an historian, Neuburger is eloquent, profound, absolutely sincere, and a good stylist. As a scholar, he is richer, deeper and more serious than Baas,

[1] M. Neuburger, Einleitung in *Handbuch der Geschichte der Medizin*, Jena, 1903.

and his accounts of folk medicine and of Greek and Arabian medicine are by far the better of the two. Yet he has no saving salt of humor and often exhibits the Germanic tendency to rhapsodize and to wander off into philosophic reverie. To present a philosophic synthesis of medical history is, in fact, the intention of his great work.[2]

Significant is also the evaluation of Neuburger's work given by Dr. John C. Hemmeter:

Max Neuburger, the brilliant author of the great two-volume "Geschichte der Medizin" separates historiography into parts: first the historic research, and secondly, the historic conception. He stipulates that in historic conception the thought must precede the detail work. This method of historic conception must be in a historiographer by nature, it cannot be acquired by any method. Thus Neuburger differs from Sudhoff in laying a greater emphasis on phantasy, and asserting that the genuine historian must be an artist—mere erudition will not suffice but in the historic research Neuburger lays the emphasis on induction as far as the detail and the proof of actuality are concerned. It is on induction that Sudhoff is not so insistent, but thinks that it often veils and colors our vision of historic facts. In evaluation of intuition as contrasted with methodology, Neuburger bases his type of research on Goethe's natural science investigation and historic conception.[3]

Neuburger's publications refer mainly to the general history of medicine and to the history of its different branches; to the history of medical problems, to the history of experimental physiology and pathology. Besides these aspects, biographies are among his favorite themes. Neuburger made contributions to Spanish medical history by writing original biographies of some great Spanish medical personalities and by translating several Spanish publications into German. He edited some works of Auenbrugger and Türck and letters of Gall.

With regard to Neuburger's *Geschichte der Medizin*, it may be said that the greatest authorities considered it as a valuable contribution. Many passages of the work were frequently quoted by many German, British, American and Italian medical historians. It was translated into English by Ernest Playfair and prefaced by Sir William Osler. Professor Sudhoff considered Neuburger's *Geschichte* "als eine glänzende, alles Vorhergehende in den Schatten

[2] F. H. Garrison, *History of Medicine*, Philadelphia, 1929, p. 884.
[3] J. C. Hemmeter, *Master Minds in Medicine*, New York, 1917, p. 71.

stellende, bedeutende universalhistorische Leistung."[4] Sir Clifford Allbutt wrote the following on Neuburger's History:

> From Neuburger's History I ought to have gleaned more than I have done. It has been on my shelves from its publication, but much of my reading on the subject had been done, and, with the war upon us, I had not time to do more than consult it occasionally on matters of obscurity or dispute, but this with advantage.[5]

Neuburger's work on Arabic medicine attracted great attention. Edward Browne, Professor of Arabic in the University of Cambridge, remarked the following:

> Of the numerous works which Sir Clifford Allbutt indicated, I have derived more profit from none than from Professor Max Neuburger's excellent Geschichte der Medizin. Although the section of this work dealing with Arabian Medicine comprises only 86 pages, it is extraordinarily rich in facts and accurate in details, and supplies an outline of the subject which is susceptible of amplification but not of correction.[6]

Neuburger contributed many original publications to the study of the evolution of neurology, cardiology, dermatology, pediatrics and urology. Of great significance are his papers on the history of experimental physiology and pathology of the nervous system. He was almost the only historian of neurology who published original papers on this subject, and he was recognized as a pioneer in this respect by Exner, Oebersteiner, v. Erb and Oppenheim at the Congress of Neurologists, held at Vienna. Among Neuburger's notable publications dealing with medical problems are his treatises on nutrition (1900) and on the doctrines of the healing power of nature (1926), the contents of which are in accord with modern medical methods.

Several of Neuburger's books and many of his articles deal with the history of the famous Vienna medical school. Among them are his works *Das alte medizinische Wien*, the *Wiener medizinische Schule im Vormärz* (1921) and his recent book *British Medicine and the Vienna School* (1943), which present authoritative and

[4] K. Sudhoff, Vorwort zu J. L. Pagel's *Einführung in the Geschichte der Medizin*, Zweite Auflage, Berlin, 1915.

[5] C. Allbutt, *Greek Medicine in Rome*, London, 1921, p. 424.

[6] Edward G. Browne, Preface in *Arabian Medicine*, Cambridge, 1921.

interesting data based on his personal observations and recollections. The majority of his biographical sketches deal with eminent Viennese clinicians and practitioners, including Van Swieten, de Haen, Stoll, Frank, Auenbrugger, v. Feuchtersleben, Skoda, Rokitansky, Semmelweis, Hebra and Bamberger. Of particular interest are Neuburger's comprehensive biographies of the renowned neurologist Ludwig Türck, of the famous clinician Hermann Nothnagel and of the great brain researcher Christian Reil. Neuburger has written on a wide range of various historical topics, including a number of obituaries, reviews and many notes on medico-historical subjects.

Neuburger has discovered many medico-historical facts of importance and presented many new viewpoints and original explanations of some historical events. He was the first to state that Théophile Bordeu (1722-76) was the predecessor of Claude Bernard and Brown-Séquard concerning endocrinology and that Bordeu was a pioneer in the modern theory of the internal secretions and hormonic equilibrium.[7] Neuburger was the first to show that John Bohn and Giuseppe Zambeccari were pioneers of experimental physiology in the seventeenth century and that Zambeccari performed four successful experimental surgical operations in succession.[8] Neuburger proved that William Harvey was the discoverer not only of the systemic circulation of the blood but also of the pulmonary blood circulation.[9] Neuburger called attention to the fact that Franz Joseph Gall (1758-1828) laid the basis for cerebral localizations of functions.[10] Neuburger proclaimed Swedenborg as a pioneer in the field of brain research, who anticipated many important facts of modern physiology, particularly those in regard to localization of motility.[11] Under the influence of Neuburger's appeal to Retzius, the Swedish Academy of Science edited Swedenborg's most important manuscripts. Neuburger was the first to record the fact that Saliceto, who lived in the thirteenth century, was the first to consider venereal contagion as the etiology of chancre, bubo and phagodemic ulcers. Neuburger

[7] M. Neuburger, *Janus*, 1903, Vol. 8, pp. 26-32.
[8] M. Neuburger, *Med. Chirurg. Centralbl.*, 1896, Vol. 31, p. 368.
[9] M. Neuburger, *Arch. f. Gesch. d. Med.*, 1930, Vol. 23, pp. 7-9.
[10] M. Neuburger, *Mitt. z. Gesch. d. Med.*, 1916, Vol. 15, p. 475.
[11] M. Neuburger, *Wien. med. Wochenschr.*, 1901, Vol. 55, pp. 2077-2081.

remarked that the supposed theory by Broussais that gastro-enteritis is the " basis of all pathology " was described long before by Tissot, Grant, Finke and Stoll.[12] Neuburger pointed out that the difference between Paracelsus and S. C. Hahnemann in the field of homeopathy consisted mainly as follows: the latter instructed his arcana not against the causes of diseases but against symptoms.[13] Neuburger asserted that the philologic study of Greek medicine displaced the labors of medieval aggregators who attempted to reconcile Hellenistic and Arabic doctrines. Neuburger stated that the merit of Biblical medicine consists chiefly in its establishment of social hygiene as a science. He was the only one to investigate the medico-historical phases of Flavius Josephus' writings on medical topics, which differ from the Biblical narrative by presenting detailed descriptions of prehistoric medicine.[14]

Neuburger published many medical notes, among them are: studies of Bacon's and Schiller's relations to medicine; the " Noctes Atticae " of Aulus Gellius; Macrobius and Theodoretus; and the poems of Silius Italicus.

Neuburger delivered seven lectures to the Gesellschaft der Ärzte in Wien dealing with Schiller's relations to medicine (1905); the poet-physician Freiherr v. Feuchtersleben (1906); Auenbrugger (1909); Laennec (1926); Harvey (1928); the Vienna medical school (1935); and the value of scientific societies for the progress of medical science (1937). He also delivered lectures before the congress of the Versammlungen deutscher Naturforscher und Ärzte on a new Papyrus (1894); on the prehistory of antitoxic therapy (1900); on Swedenborg as a pioneer in the physiology of the brain (1900); on Peter Frank as founder of the pathology of the spinal cord (1909); and on Christian Reil as a researcher of the brain (1912). In 1910 Neuburger attended the International Swedenborg Congress in London, and delivered two lectures on Swedenborg's work concerning the spinal cord, and on Swedenborg's relation to modern physiology. In 1922 he was invited by de Lint to

[12] M. Neuburger, Einleitung in Puschmann's *Handbuch der Medizin*, Jena, 1903, Vol. 2, p. 96.

[13] *Ibid.*, pp. 125-129.

[14] M. Neuburger, *Die Medizin in Flavius Josephus*, Jena, 1919.

deliver lectures in the Low Countries, and by Johnson to give lectures in Copenhagen. In 1923 he was invited by Hull to lecture in Lund, Stockholm and Upsala. Neuburger also delivered lectures to the medico-historical sections of Carlsbad (1902), Salzburg (1903), Meran (1905), and General Session of Congress in Vienna (1913). In 1935 he attended, as deputy of the Vienna medical faculty, the International Congress of History of Medicine at Madrid and delivered there a lecture on Gomperz Pereira. In 1936 he attended the first World Congress of the Jewish Physicians in Palestine and delivered at Tel-Aviv a lecture on the role of the Jewish physicians in the history of medicine. In 1937 he spoke before the International Congress of the History of Medicine, held in Prague, on the physiologist Georg Prochaska as the forerunner of Purkinje.

Neuburger was editor of the *Wiener medizinische Blätter* (1902-03), co-editor with Julius Pagel of *Handbuch der Geschichte der Medizin* (3 volumes, Jena, 1902-05), and of *Meister der Heilkunst* (6 volumes, 1921-24). Neuburger edited the following: Ludwig Türck's *Neurologische Schriften* with a Biographical Introduction (Wien, 1910) and Leopold Auenbrugger's *Inventum Novum*, adding his comprehensive biography of Auenbrugger, the inventor of percussion of the chest (Wien, 1922). He translated from Spanish to German some medical articles and a book, *Die Augenheilkunde in der Römerzeit*, by R. Quartiellers (Leipzig u. Wien, 1907).

Neuburger was a teacher of medical history at the University of Vienna for forty years (1898-1938). His pupils were not only Viennese students but also foreign doctors, particularly American ones. He tried to develop in his listeners love and interest of his subject. One of his former pupils, Dr. Robert Rosenthal, of St. Paul, Minnesota, in a personal communication to the author writes:

> My contact with him started about 1919. Medical history came to life when Neuburger began to talk. His thorough knowledge and understanding of various problems made us listen to him with admiration. His love for his subject was most contagious. His classes usually were not large, a fact which made them more intimate. His kindness, patience and encouragement made a deep impression. He gave his lectures at the Institute of History of Medicine surrounded by pictures, medical objects and books which he used very frequently to illustrate the subject under discussion. He took a great interest in his pupils and stimulated them to do medico-historical

research, being most generous in helping them. I usually lingered behind when the class was dismissed and was awarded an opportunity of accompanying him to his home. I learned much during these walks that could not be learned in lectures. He always was unusually kind, in an atmosphere of dignity, when one hardly attempted to speak to a professor.

Neuburger's important contribution to medical history was also his founding of the Institute of History of Medicine and Medical Museum at the Vienna University. The history of this Institute reads like a romance. It was founded by Neuburger in 1912 without any subsidiary from the Austrian ministry of education during the first decade of its existence. It took several years before the government conceded a proper place for the display of Neuburger's collection and granted a very small sum for the maintenance of the Institute. Neuburger himself donated to this institution his own valuable library and his rich collection of reprints, portraits and various objects of medical history. In addition, his many friends, particularly those of Austria, Great Britain and United States, under his stimulation, aided in the course of time the growth of the Institute with donations of books, pictures, and instruments of historical value. In 1919 the collections were transferred from the small space behind the amphitheater of the first medical clinic to the building of the former Military Medical Academy, the so-called " Josephinum," where a famous collection of anatomical wax models and a rich medical library had been in existence since the end of the eighteenth century. The Institute then had the use of three large rooms, but as the collection outgrew the limited space, two smaller rooms and the Bibliotheca Josephina's reading room were added. The latter was used as an auditorium. The advancement of the institution was so rapid that in 1934 it had already fifteen rooms containing a library of about 10,000 volumes of ancient medical literature, a collection of about 3,000 medico-historical engravings and many interesting surgical instruments.

The fame of this Institute attracted visitors from all over the world. Doctors of European and American countries, of Egypt, India, China, and Japan visited the institution. Among them were Welch, Garrison, Sigerist, Abt, Jelliffe, Wickersheimer, Klebs, Castiglioni, de Lint, Johnson and Kousis. Descriptions of the Institute were

Fig. 2.

Professor Max Neuburger at the age of 73.

published in German, British, American and Italian medical periodicals. Dr. Victor Robinson, who visited Neuburger's Institute in its early days, recorded the following:

> The creation of an institute of the history of medicine in connection with the University of Vienna has been the life-dream of Professor Max Neuburger. . . . At last in the Josephinum three unused rooms that were empty except for years of dust and rubbish were given to Neuburger. There was neither salary for the director nor wages for a janitor, but with herculean ardor Neuburger and his two sons set themselves the task of cleaning out the Augean stables of the historic Josephinum. From floor to ceiling those rooms were purified, and when the windows were being washed the long exiled sunlight streamed in to welcome the new institute. Neuburger's younger boy took his father's old practitioner sign, erased the lettering, and painted instead: Institute für Geschichte der Medizin. . . .
>
> Unaided and in ill-health, without funds and without recompense, Max Neuburger has built a museum which a million dollars could not put together, and whose cultural richness can hardly be realized. Only a man whose life has been consecrated to the history of medicine could bequeath such an institute to mankind.[15]

Dr. Abraham Levinson presented the following description of the Institute:

> In the lecture room are portraits of men who have made medical history, copies of papyrus, a photograph of Laennec, the stethoscope of Laennec, the first roentgenogram, infants' nursing paraphernalia, vaccination certificates the original ophthalmoscope, Chinese pharmaceutical preparations, and a skull subdivided into areas according to Gall.
>
> In the Vienna room, one finds portraits of famous Vienna physicians, conspicuous among which are those of Skoda and Billroth; medals, letters, and prescriptions of old physicians, especially the prescriptions of Gall and Skoda.
>
> It contains instruments such as those of Billroth, Türck, Albert and others, working glasses of Hyrtl, the microscope of Rokitansky, the ophthalmoscopic set of Arlt, and the first laryngoscope of Czermak.[16]

Neuburger won international fame as a master of medical history. F. H. Garrison, Sir William Osler, Harvey Cushing and Sir

[15] V. Robinson, A Medico-Historical Pilgrimage, *Med. Life*, New York, 1923, Vol. 30, pp. 590-591.

[16] A. Levinson, Professor Neuburger and His Institute for the History of Medicine. *Bull. Soc. Med. Hist. of Chicago*, 1924, Vol. 3, pp. 295-296.

D'Arcy Power have established his reputation in the United States and Britain. In recognition of his important scientific accomplishments in his chosen field many honors have been conferred upon him by numerous scientific associations and also by some governments. He won honorary membership of the Swiss, Dutch, Italian, Greek and Rumanian historical medical societies, of the medical history section of the Swedish Society of Physicians at Stockholm, of the American Medical Library Association, of the American Association of the History of Medicine, of the Society of Medical History of Chicago, and the Society of Medical History of St. Louis. He was elected honorary fellow of the Société Internationale d'Histoire de la Médecine and of the Société Française d'Histoire de la Médecine. He was also elected corresponding member of the Verein für Innere Medizin, Berlin; of the Academy of Science in Lisbon; of the Swedish Medical Society of Stockholm; of the Archaeological Institute in Moscow; of Italian and Spanish Medical Academies (Madrid, Bologna, Barcelona, Cordova and Granada), of Austrian, Hungarian and German medical societies (Vienna, Budapest, Berlin, Würzburg and Munich). He was a member of the oldest Deutsche Akademie der Naturforscher und Aerzte at Halle. He was elected corresponding member of the Swedish Historical Society and extraordinary member of the Kaiserlich-Leopoldinisch-Karolinischen Akademie der Naturforscher.

Several medical historians have dedicated their publications to Neuburger, among them are I. Fischer (Vienna), Tesdorp (Munich), Strunz (Vienna), M. Lemos (Oporto), Comenge (Barcelona) and Temkin (Baltimore). He was elected vice president of an International Swedenborg Congress which was held in London, July 1910. In 1928 a *Festschrift* in honor of his sixtieth birthday was published by his friends, colleagues and pupils of Austria, Germany, France, Netherlands, Italy, Denmark, Sweden, England and America. In the same year a medal with his portrait was fashioned in his honor. In 1930 Garrison edited *Essays in the History of Medicine* by Max Neuburger. It contains translations of twelve of Neuburger's articles. Garrison in his Foreword to this book remarks that it was translated by a number of Neuburger's admirers as a belated birthday tribute. In 1935 Neuburger was promoted

honoris causa as Doctor of Medicine at the Old University College at Alcalá (near Madrid) and in consequence of this degree he received a diploma as corresponding member of the College of Physicians in Madrid. In 1937 Neuburger delivered his lecture before the Gesellschaft der Aerzte in Wien on the anniversary of its foundation centenary (1837-1937); then the chairman Professor von Eiselsberg, Billroth's pupil, presented to Neuburger publicly the Billroth-medal. In June 1943 the Wellcome Historical Museum of London celebrated Neuburger's fiftieth "Doctor Jubileum" (1893-1943). In normal days the University of Vienna used to present to its graduates on such occasions a second Doctoral diploma in a golden frame.

In 1938 Neuburger had been elected honorary member of the following medico-historical societies: Société Française d'Histoire de la Médecine (Paris); Société Internationale d'Histoire de la Médecine, and the American Association of the History of Medicine. In 1939 he received the diploma of Honorary Fellow of the Royal Society of Medicine (London).

Neuburger received the following decorations: Knight of the Austrian order of Franz Joseph; Knight of the Spanish Order of Alfonso XII; Commander of the Swedish Wasa Order; Commander of the Spanish Order of Isabella; Commander of the Greek Phoenix Order; Commander of Grosses Ehrenzeichen für Verdienste um die Republic Oesterreich; and Officer-Ehrenzeichen des Roten Kreuzes.

In 1939 Neuburger left Vienna for London, where, on the recommendation of Sir D'Arcy Power and Dr. Charles Singer, he was appointed in September 1939 in an advisory capacity at the Wellcome Historical Medical Museum in London, and since 1942 he has been a member of the staff at the same institution. In September 1939 he was honored by a call to occupy a chair at the Northwestern University Medical School in Chicago, but owing to the outbreak of the war he was unable to accept the invitation.

Neuburger, the veteran medical historian, began his medico-historical work forty-five years ago at the time when the subject was in its incipiency and not a popular one. He was one of the main builders who helped to make medical history an organized part of science based on the phases of general history and culture. He exerted a profound influence on the current history of medicine. His

many publications contain new streams of ideas intended not only for medical historians and physicians but also for men of science who are interested in the studies of the general evolution of history and culture. The originality and the brilliant correlation of the vast material of Neuburger's work resulted in the translation of many of his publications into several languages. At present at his age of seventy-five he is full of mental vigor and love for his favorite subject, and still continues to enrich the medico-historical literature.

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BRITISH MEDICINE
AND
THE GÖTTINGEN MEDICAL SCHOOL IN THE EIGHTEENTH CENTURY

MAX NEUBURGER

To the memory
of Julius Leopold Pagel

Hanover was under British Sovereignty from 1714 until 1837. Of the connection between Hanover and Great Britain in the reign of George II there are two pleasant reminders. With the support of the King the Hanoverian Handel produced in England those masterpieces which have given delight to millions, whilst the foundation of the University of Göttingen opened a door through which British scientific and political ideas penetrated into Germany.

During the eighteenth century inadequate facilities for teaching and research prevented the majority of the medical schools in Germany from furthering either medical training or scientific progress to the extent one would have expected from their large number. Exceptions were the Vienna Medical School and the Medical Faculty in Göttingen; both owed their brilliant reputation particularly to the outstanding pupils of Boerhaave. The Vienna Medical School owed its celebrity to Gerhard van Swieten, and with Albrecht v. Haller at Göttingen this school came into unusual prominence at the very outset of its career.

In 1734 George II, King of Great Britain and Ireland, Elector of Hanover, founded the University of Göttingen, and determined to equip it in such a way that it could really contribute to the progress of science as one of the foci of research. Freiherr v. Münchhausen, Chancellor of the new university, was appointed to guide the development of the Georgia Augusta. He made a happy choice by sending Haller a "call" to Göttingen in 1736 when the chair of medicine became vacant, which embraced anatomy, surgery, and botany. Haller had signified to his friend Dr. August T. Hugo, Consulting Physician to the House of Hanover and friend of Münch-

hausen, his desire to enter academic life by joining the Faculty of Göttingen. Hugo brought Haller's candidature to the attention of Münchhausen and Werlhof, then Court Physician to George II.

Haller, who had been in Leyden on friendly terms with British fellow students, obtained his doctorate there, and then went to London to gain further experience. He arrived towards the end of July, 1727, and settled in rooms near the Strand, where he became interested in the coffee houses which were then flourishing in the English capital, and in these he met physicians, authors, poets and scientists. Although he spoke English very poorly, he was impressed with its flexibility and its beauty in poetry. Haller became acquainted with a number of English physicians. John Pringle had been his fellow student at Leyden and through him he received an introduction to the anatomist and surgeon William Cheselden. Haller also became the friend of the physician and famous naturalist Sir Hans Sloane, whose rich collection of books, manuscripts, medals and coins, drawings and pictures, etc., became the nucleus of the British Museum. Haller was a constant visitor in the Surgical Department of St. Thomas's Hospital (then under the direction of Cheselden, whose dexterity in the performance of lithotomy excited the wonder of his contemporaries), where he enjoyed the anatomical instruction of James Douglas. Haller's *Tagebücher seiner Reisen nach Deutschland, Holland und England* in 1723-1727, and the collections of letters addressed to him afford an insight into his relations with British scientists.

In due course Haller received the appointment as Professor at the Georgia Augusta, which the new University was called. Haller arrived in Göttingen on the last day of September, 1736. He was widely and favourably known at this time as botanist, anatomist, physiologist, and as a many-sided scholar and poet. His academical activity was brilliantly displayed throughout seventeen years in the spheres of anatomy and physiology, botany and, for a time, of surgery also. The greatest influence on the affairs of the University was exerted by Haller; he was responsible for the erection of an anatomical theatre, a botanical garden, a lying-in institution, etc.; he played the chief part in establishing the *Göttingische Zeitung von gelehrten Sachen*, to which he contributed 12,000 articles, critiques,

etc., and in founding the " Societät der Wissenschaften," of which he was the first and permanent president as long as he lived. Haller attracted students and graduates from all parts of Germany as well as from all countries of Europe. As a lecturer he was precise in exposition, clear in statement and severe in deportment. His medical observations were co-ordinated with the studies in the anatomical theatre, and by his interpretation he evolved his principles of physiology. The preliminary intensive investigation for the treatises on botany, anatomy and physiology, and pathology were also carried on at this time. Between the years 1739 and 1744 Haller completed the six-volume edition of Boerhaave's *Institutiones*, which led to his election to the Royal Society of London, filling the place left by Boerhaave's death. Haller finished the *Opuscula minora*, he produced the *Icones Anatomicae*, the first textbook of physiology entitled *Primae Lineae Physiologiae*, and a great number of articles and monographs upon anatomical, medical and botanical topics.

In 1739 Haller was appointed Physician-in-ordinary, and later an English State Councillor. George II conferred a Knighthood upon him, and appointed him as one of his consulting physicians. But owing to ill-health Haller repeatedly began longing for his beloved Switzerland and left Göttingen in 1753. Although in later years he received repeated invitations from the University and from George II to return, he declined to leave his native country.

In Haller's monumental works of bibliography it goes without saying that British medical literature is worthily represented and carefully reviewed. Haller's influence extended directly or indirectly over the whole field of anatomy in his period; he was the centre of a school in which exactitude in research and a felicitous gift of description were harmoniously blended. Haller's inspiration fell directly on Johanne Friedrich Meckel, the first of a family of famous anatomists, and Meckel's, in its turn, on Alexander Monro the second, who, before becoming professor in Edinburgh, travelled on the Continent and was received by Meckel into his house.

Haller was the most important exponent of *Physiology* in the eighteenth century, and conscientiously mentioned his British predecessors in the various spheres, although he sometimes underestimated the importance of their achievements. Thus he cited John Mayow's

treatise *De Respiratione* (Oxon., 1668), but does not sufficiently do justice to its most important contents: Mayow described the mechanism of respiration with the movement of ribs and diaphragm almost perfectly, and by him the crowning discovery was made. He first clearly stated the existence of a special gas in the air necessary both for life and combustion. Having shown that his " nitro-aereal particles," which a century later were called *oxygen*, caused the change of colour of the blood in the lungs and were essential to life, he argued that they were also essential to the vital activity of other parts of the body, especially to the muscles for their contraction, and to the brain.

Haller seems also not sufficiently to have appreciated the outstanding achievements of Stephen Hales; at least, although he quotes the experimental results of Hales which laid the foundation of Haemodynamics, he does not mention them when he is discussing arterial lateral pressure.

While Thomas Willis had begun, during the seventeenth century, to prove the localisation of the functions of the brain by experiments on animals, Haller came to an entirely opposite result and later conceded at the most the particularly vital importance of the Medulla oblongata.

Haller was led to the conclusion that irritability and sensibility are the basic phenomena of animal life. He had been forestalled by the Englishman Francis Glisson in the formulation of the concept of irritability, Glisson meaning by this the general tendency of the animal body to react to environmental influences. For Haller irritability was the characteristic possessed by certain organs, and especially by the muscles, to react to stimuli; that is to say, in the case of muscles, to respond by contractions to mechanical, thermal, chemical and electrical influences.

Glisson established deductively the principle of a general irritability, and Haller proceeded to follow up this principle by the inductive method, proving its existence by experiment. In contrast to the generalization of Glisson, Haller taught that this " irritability " was something entirely special, a simple peculiarity of the muscular substance, opposed to sensation as the second vital phenomenon.

In England William Battie was particularly noteworthy among the followers of Haller's doctrine, while Robert Whytt and Samuel

Farr raised objections of greater or lesser importance. In 1751 Whytt published a work *On the Vital and other Involuntary Motions of Animals*. The book of the Professor at Edinburgh attracted the attention of the physiologists of Europe. Whytt, the discoverer of reflex action, who spent a large part of his time in experimental work on animals, ascribed all involuntary motions to the effect of a stimulus acting on an unconscious " sentient principle." As a result of his experiments on decapitated frogs Whytt had a vigorous controversy with Haller on the subject of the work. In practical medicine Haller's doctrine of irritability bore rich fruit, especially in a trend that originated in Scotland—Cullen's pathological doctrine and the " Brunonian system."

Of Haller's writings the following were translated into the English language:

First Lines of Physiology. Translated from the Latin. Printed under the inspection of William Cullen, Edin., 1779.

A Dissertation on the Sensible and Irritable Parts of Animals. Translated from the Latin. With a preface by M. Tissot, London, 1755.

Pathological Observations, Chiefly from Dissections of Morbid Bodies. London, 1756.

A Dissertation on the Motion of the Blood, and on the Effects of Bleeding, etc. Translated by a physician, London, 1757.

Physiology; being a course of Lectures upon the Visceral Anatomy and Vital Economy of Human Bodies. London, 1754. The same, 2nd Edition. London, 1772.

At Haller's instigation Joh. Georg Röderer was appointed to the chair of Midwifery at Göttingen. He had perfected his training by a long sojourn in Paris and London, where he had eagerly studied Anatomy under Hunter, Medical Practice under Lobb, and particularly Midwifery under Smellie. With Röderer scientific midwifery in Germany began. He established The Clinical Institute of Midwifery in Göttingen, and was the first German to write a texbook on Midwifery for physicians.

After Haller's departure from Göttingen, Röderer also took over

the chair of Anatomy and Surgery, and in 1754 he was appointed to be Physician-in-ordinary to the King of Great Britain.

One of the most influential patrons of the University of Göttingen, and a friend of Haller, was Paul Gottlieb Werlhof, who gained a great reputation for his achievements as a practitioner in Hanover and as a writer on medical subjects. With his name is connected the complex of symptoms *Morbus maculosus haemorrhagicus*. He translated from English into Latin the treatises: *Actorum medicorum Edinburgensium specimina duo de medicamento alterante ex mercurio et de aurigine, ex anglico sermone latine redditit* . . . (Hannoverae, 1735). In 1740 Werlhof was appointed as Physician-in-ordinary at the Court in Hanover. After his death one of Haller's earliest pupils, Johann Georg Zimmermann, was appointed there as Aulic Councillor and Physician-in-ordinary to the King. Zimmermann had obtained his doctorate in Göttingen with the dissertation *De Irritabilitate*. He is particularly well known for his writings *Uber die Einsamkeit, Von der Erfahrung in der Arzneikunst, Von der Ruhr unter dem Volke*, and for his relations with the Empress Catherine II of Russia and with Frederick the Great. One of his books, which was translated into English under the title of *A Treatise on Experience in Physic*, London, 1782, is written in a truly philosophical spirit, the spirit of Bacon. His work *Von der Ruhr unter dem Volke* also appeared in English under the title of *A Treatise on the Dysentery*, London, 1771-1774.

The high estimation in which Zimmermann was held as a physician is shown by the fact that in 1788 he was sent to Holland by the Hanoverian Government to be within easy reach of London in case the illness of George III took a turn for the worse.

An intimate friend of Werlhof and also of Zimmermann was Johann Ernst Wichmann, who held the post of second personal physician at the Hanoverian Court, with Zimmermann as the first. During a lengthy stay in London, Wichmann had acquired a thorough knowledge of English medicine and he tried energetically to spread its principles in Germany. He applied himself to writing, mainly translating various English medical works into German. Wichmann's chief work, based on extensive experience, appeared under the title *Ideen zur Diagnostik*, and contains not only excellent

observations on the diagnosis of disease but also a thoroughly rational system of therapeutics. In this work almost all British physicians of note are repeatedly quoted, and Wichmann emphasizes to their credit the fact that it is precisely to the British observers of recent times that one owes the first and most instructive histories of diseases. Wichmann also produced an edition of Werlhof's *Opera Medica*, 1775-76, which he dedicated to the late Werlhof's friend John Pringle. Among Wichmann's translations from English into German, special attention should be paid to his translation of Donald Monro's *An Account of the Diseases of the British Military Hospitals in Germany*, from January 1761 to March 1763.

Another member of the Göttingen-Hanover circle was L. Fr. Benjamin Lentin, the emphatic opponent of John Brown's system, who, first in Lüneburg and then in Hamburg, was the darling of the public, both medical and lay. Following in Sydenham's path, he rendered particularly good service in Epidemiology. In 1796 he was appointed second Physician-in-ordinary at the Hanoverian Court.

German physicians first became acquainted with the system of John Brown as the result of a scandal. Girtanner, who had studied medicine and obtained his doctorate in Göttingen, got his knowledge of John Brown's doctrine during his stay in Edinburgh, and, directly after his return to the Continent, published it, although with some modification, as his own discovery without the slightest allusion to Brown. In a notice in the *Göttingen Nachrichten*, Girtanner declared that his teaching had awakened interest and found approval in Edinburgh. Only in 1795 was this deception discovered by Weikard.

Christian Friedrich Michaelis, son of Göttingen's famous orientalist, T. D. Michaelis, was the author of the treatise *De Angina Polyposa* in which he recommended tracheotomy. Francis Home's *Inquiry into the Nature, Cause and Cure of Croup* (Edinburgh, 1765) had been published previously and had been taken as a model. In London, Michaelis had become acquainted with Cruikshank's preparations, which the latter had placed before the Royal Society as a proof of the regeneration of the substance of the nerves. Michaelis himself also undertook similar researches.

Johann Friedrich Gmelin, the pharmacologist who rendered such good service to the history of chemistry and history of poisons, had

also made a lengthy stay in England. From 1798 he taught in Göttingen as a member of the Medical Faculty and held the title of Aulic Councillor at the Hanoverian Court.

It was in direct consequence of the relations existing between Hanover and Great Britain that Variolation and Vaccination were introduced remarkably early into Hanover. As regards Variolation, the first to make it known in Germany was Matthias Ernst Boretius, the Königsberg city physician, who had learnt the procedure in England in 1722. He published *Specimen observationum exoticarum sistens famosam Anglorum variolas per inoculationem excitandi methodum* cum eiusdem phaenomenis et successionibus prout nempe in carcare Londinensi Newgate auctoritate publica in sex personis capite damnatis feliciter fuit instituta. In the same year the Embassy Physician Maitland successfully inoculated Prince Friedrich, which occasioned the publication in Hanover of Johann Ernst Wreden's work *Vernünftige Gedanken von der Inokulation der Blattern.* Haller too was one of those in Germany who later recommended the improved method of Sutton and Dimsdale. As regards vaccination, Georg Friedrich Ballhorn and the surgeon Christoph Friedrich Stromeyer rendered good service in Hanover in that they founded special institutions for spreading vaccination, and made propaganda for this innovation by every possible means. Stromeyer, Court Surgeon in Hanover, had visited London in 1792-1793 in the interest of his studies.

Samuel Thomas von Sömmerring, the greatest German anatomist of the second half of the eighteenth century, remained in close contact with the Medical Faculty at Göttingen, and with its publications and Library, until his death. Sömmerring's letters to his father give much information regarding activities, professors and studies. He praised Baldinger for his very entertaining lectures, and Richter's instruction in surgery was of unusual interest to him, but anatomy had the greatest fascination for Sömmerring. It was Blumenbach, who gave lectures on natural history, and Wrisberg, the outstanding anatomist, who inspired in him enthusiasm for research. Wrisberg praised his work and advised him to choose anatomy as his career, to write a good thesis and to make a trip to England. With a very good dissertation *De basi encephali et originibus*

nervorum, Göttingen, 1778, Sömmerring surpassed his master, who had rendered great service to the anatomy of the nervous system (description of the N. Trigeminus, N. phrenicus, N. splanchnicus, Ganglion Wrisbergii, etc.).

On August 18, 1778, Sömmerring arrived in London. He visited Oxford, but spent most of his time with John Hunter, and it was at the latter's house that he became acquainted with William Hunter, Cruikshank, Sheldon and Pringle. His studies in London were confined mainly to anatomy and surgery. Sömmerring eagerly studied Hewson's lymphatic injections, and took his first lessons on injecting them under Sheldon, the anatomist. This technique he perfected under Alexander Monro in Edinburgh. Sömmerring was the first to bring this technique into Germany, and Tiedemann prided himself on having learned it from him. It was Hunter who taught Sömmerring to make sections of teeth. The greater part of the winter of 1778-1779 Sömmerring spent in the beautiful city of Edinburgh, and there he acquired a life-long love for British customs.

No one was so well qualified as Sömmerring to produce in German translation that fundamental work *The Morbid Anatomy of some of the most Important Parts of the Human Body*, by Matthew Baillie, John Hunter's pupil. The translation of this work, which treated systematically the entire field of morbid anatomy for the first time with exemplary accuracy, appeared in many editions, the first one in 1794.

Particularly interesting information about academic circles in Göttingen is provided by Thomas Young, later to become so famous. He commenced studying for the medical profession in 1792, and first attended the lectures of Baillie, Cruikshank and John Hunter. In 1793 he entered for a year as a student at St. Bartholomew's Hospital. On May 30, 1793, he read a paper before the Royal Society, in which he attributed the accommodating power of the eye to a muscular structure of the crystalline lens. This led to his election as a member of the Society.

In the autumn of the year 1794 Young proceeded to Edinburgh, where he attended lectures by Gregory, Duncan and Jos. Black. In October, 1795, he went to Göttingen to continue his studies. He established himself, for the six months' session, in a house belonging

to Professor Arnemann, who had been long in Britain and had brought home an English wife with him. To Justus Arnemann not only medicine, but also pharmacology, surgery and ophthalmology are deeply indebted. He gained his Doctorate at Göttingen, and his dissertation treated of the regeneration of the nerves, brain and of the spinal cord. Arnemann's treatise *On the Reproduction of the Nerves*, Göttingen, 1786, bore a motto taken from Bacon: Non fingendum aut excogitandum, sed videndum quid natura ferat vel faciat. He made a tour which took him to Berlin, Vienna, Paris and, for a protracted visit, to London. On his return Arnemann published *De morbo venereo analecta quaedam ex MSS. Musei Britannici Londinensis*, and in 1790 began the publication of his *Bibliothek für Chirurgie und praktische Medizin*. In 1792 Arnemann was appointed Professor in Göttingen, and in 1796 he founded there a surgical clinic as a private establishment, which later became a medical and surgical institute.

It was the Göttingen Medical School too, which, through the medium of one of its best teachers, exerted the greatest influence on the advance of German surgery. This was August Gottlieb Richter, who, on completion of the usual studies, had visited London, Paris, Leyden and Amsterdam, and in 1771 was made a Professor. Richter was the first German surgeon who, by word and writing, disseminated the basic ideas of the English surgeons and, following the example of John Hunter, worked towards the incorporation of surgery into scientific medicine. His chief work *Anfangsgründe der Wundarzneykunst*, in seven volumes, was chosen as a model for later text-books on this subject.

In order to acquaint the German surgeons with the achievements of the French and English, he brought out the periodical *Chirurgische Bibliothek*, the first undertaking of this kind. Richter's work *Medicinisch-chirurgische Bemerkungen* was translated into English. Furthermore, Richter rendered good service in raising ophthalmology to the status of a science. His treatise on operation for cataract was translated into English entitled: *A Treatise on the Extraction of the Cataract*, London, 1791.

On October 29, 1795 Young matriculated, and on November 3 entered upon his academic studies and occupations. He attended

Arnemann on Materia Medica, Richter on acute diseases, Stromeyer on diseases, and Blumenbach on natural history. Of the lecturers of the Medical School Blumenbach was the most considerable. Young speaks of his lectures as not being very deep but containing much general information. Their interest was not a little increased by the genial manner of the lecturer and the amusing anecdotes with which they were occasionally interspersed.

Two other lecturers—Arnemann and Richter—whose courses he attended throughout with exemplary regularity, were also men of very great eminence and very voluminous medical writers. Young took no notice of the anatomical and surgical lectures, though the staff of professors who gave them was no less complete than that of medicine.

On March 21, 1796, Young addressed the usual letter of application to the Medical Faculty, requesting to be examined preparatory to his degree. On April 30 he passed the examination in company with three other students, Niemeyer, Treviranus and Grabenstein. "I made," says he, "no preparatory study, as is usual here and also at Edinburgh not uncommon under the name of 'grinding'. The examination lasted between four and five hours; the four examiners were seated round a table well furnished with cakes, sweet meats and wine, which helped to pass the time agreeably; the questions were well calculated to sound the depth of a student's knowledge in practical physic, surgery, anatomy, chemistry, materia medica and physiology. But the professors were not very severe in exacting accurate answers. Most of them were pleased to express their approbation of my replies. We were all previously obliged to give a short account of the manner in which our lives had been spent."

The subject which, after much deliberation, Young chose for his dissertation was *De Corporis Humani viribus conservatricibus*. It is of considerable length, extending to eight pages, and is written in very correct Latinity. The great library of the University supplied him with all the books bearing upon his subject, which he felt it necessary to consult, and amongst them he particularly mentions Brandis *Über die Lebens Kraft* and Hüfeland's *Ideen über Pathogenie*. The dissertation was finished and printed early in June, and received the ready approbation of the 'Censor' (the Dean of the

Faculty), who spoke in very high terms of its merits. On July 16 Young proceeded with his "praeses" (Wrisberg) and his two opponents (Weber and Nöden) to the summer Auditorium, where he read a short thesis called a *Lectio cursoria*, the subject of which was the human voice, on which the formal discussion was held. He was complimented on his performance, and after reading something like a prayer, was married to Hygaed and created doctor of Physic, Surgery and Man-midwifery.

The relative merits of English and German medical writers and medical practice were made frequent subjects of discussion in the correspondence which passed between Young and his uncle, Richard Brocklesby, who had resided in Germany as physician to the British Army during part of the Seven Years' War. Brocklesby was a good authority on the practice and well acquainted with the literature of his profession, but he was not free from the prejudices respecting German physicians and their writings. Young wrote to him as follows:

> I will venture to repeat that your opinion of the state of physic in this country is formed from viewing it on the worst side; your acquaintance with their authors is probably almost confined to those who wrote forty years ago; and since that time, although something old-womanish may perhaps still remain, yet the main bulk of the art has undergone a great revolution.
>
> They translate and read, but do not believe all the new theories that start up. Brown's, Beddoe's and Darwin's works are all well known, and Hunter's book will probably soon be turned into German. All the practical works are also immediately attended to; they have also among the crowd of their own authors many who observe and think for themselves. The kindred sciences of anatomy, botany and chymistry, are upon the whole further advanced than in Britain; and the lectures here on physic and the materia medica are unquestionably better than those which I heard on the same subjects at Saint Bartholomew's Hospital. From all this I do not conclude that their practice, generally speaking, is equal to the English but that it is not greatly inferior, and that one who is disposed may learn in German books and from German lectures, something which is not contemptible.

On another occasion Young says:

> The English physicians are quoted as familiarly here as they are at home; the Germans know what London contains better than many of our own countrymen. But the reverse does not hold good, the German authors are very imperfectly or not at all known in Britain. The English may say that

the German medical practice is theoretical and feeble. The Germans allege that the treatment in London is merely empirical, and that while one half of the Faculty is led away by extravagant hypotheses, the other acts only on the narrowest experience. The truth perhaps is in the medium, and at any rate the science here has one advantage that the doctrines of both countries are well known here, while the English attend little to any opinions but those of their own country.

Whether the human mind is on the average in a more cultivated state in this or in that country, it is very difficult to say. There are more learned men in Germany than in England, but we have, and ever have had, some individuals in many branches who are almost unequalled.

As at the beginning of this period Haller's outstanding personality left his unmistakable influence on the medical school of Göttingen, so at the end of the eighteenth century Johann Friedrich Blumenbach's work brought the reputation of the school to the top pinnacle of fame. Here was a man of very wide reading, endowed with remarkable reasoning power, and with exceptional perspicuity for separating the true from the false. He was endowed with such attractiveness that Göttingen gained greatly in its patronage through his influence. Listeners came to him from many countries and went home full of his praise, and his textbooks of comparative anatomy, physiology and natural history, etc., passed through numerous editions.

Blumenbach studied first in Jena and then in Göttingen. At both Universities he also attended lectures on the English language. He graduated at Göttingen in 1775, and was appointed there as Extraordinary Professor of Medicine in 1776, and as Ordinary Professor in 1778, which position he retained until his death in 1840.

Blumenbach turned his attention early to the study of Man, and was the first to show the value of comparative anatomy in the study of the history of Man. His *Handbook of Comparative Anatomy* (1805) was the first of its kind, not only in Germany but throughout the learned world. Before this time there was no complete book on this branch of learning. Natural history, not the description of nature, was the aim Blumenbach placed before him. With Bacon he considered that as the first subject of philosophy. Inasmuch as he regarded physiology as the true foundation of the science of medicine, it is not difficult to perceive from what point of view his con-

tributions to practical medicine are to be criticized; besides, he let slip no opportunity of showing his sympathy in that particular direction. Thus he gave his opinions on the frequency of ruptures in the Alps, on nostalgia, on melancholy and suicide in Switzerland, on a case of water in the head of seventeen years' standing, etc. Blumenbach also contributed to the extension of the science of medicine by experiments with gases on living animals, and by the communication of a new sort of dragon's blood from Botany Bay on the coast of New Holland and by a description of the true winter's bark.

Eighteenth century vitalism assumed a specifically modern form in the " Bildungstrieb " of Blumenbach, which argues an innate impulse in living creatures towards self-development and reproduction. Blumenbach recognized that each type of living creature developed in accordance with a specific constructive design, that a " nisus formativus " was at work in them. For Blumenbach, the basic physiological phenomena were irritability and sensibility in addition to this formative impulse which, in its regular operation, manifests itself in generation, nutrition and reproduction.

Blumenbach's *Elementa Physiologiae* is remarkable for the elegance of its language, for a well selected display of reading and the abundance of his own observations. He busied himself much with the question as to whether or not a peculiar vital energy ought to be attributed to the blood. On the appearance of the posthumous work of John Hunter's *On the Blood*, in 1795, Blumenbach published *De vi vitali sanguini deneganda, vita autem propria solidis quibusdam corporis humani partibus adserenda.* Blumenbach in his *Institutiones Physiologicae* (Gottingae, 1786, p. 11) was the first to give Mayow's works high praise, and he was followed by Yeats, Beddoes, Fourcroy, Josef, Scherer and Johann Bapt. Andr. Scherer (*Beweis dass Johann Mayow vor 100 Jahren den Grund zur antiphlogistischen Chemie und Physiologie gelegt habe,* Wien, 1793). Blumenbach was the first to place anthropology on a rational basis, and in his *De generis humani varietate nativa* (Göttingen, 1775) laid the foundation of race classification based on measurement. In the very same year (1775), and a month or two before the most famous work of Blumenbach, appeared in Edinburgh the inaugural dissertation of John Hunter (a physician to the Army) entitled *De*

hominum varietatibus et harum causis. This was very inferior in its method of treating the subject to the effort of the German naturalist, nor does the author seem to have pressed his researches further in this direction.

Blumenbach noted the variations in the shape of the skull and of the face, and to that extent may be regarded as the founder of craniology. He was the fortunate possessor of a large number of skulls and he published a description of them, illustrated with seventy plates (Decas I-VI collectionis suae craniorum diversarum gentium illustrata, Göttingen, 1790-1820). Blumenbach was the first to popularize craniology, and it became the fashion to visit his Museum. He is also remembered by the *clivus Blumenbachii* (occiput). Within the species *Homo sapiens* Linnaeus included wild or natural man, *Homo sapiens ferus*, whose existence was widely believed in at the time. The most authentic case was that of "Wild Peter," the naked brown boy discovered in Hanover in 1724. He was sent to London, and under the charge of Dr. Arbuthnot became a noted personage and the subject of keen discussion among philosophers and naturalists. Blumenbach alone took the trouble to investigate the origin of Wild Peter, and finally proved that Peter was the dumb child of a widower, who had been thrust out of his home by a new step-mother.

Three Royal Princes of Great Britain, who arrived in Göttingen on July 6, 1785, attended the lectures of some of the professors and were seen on the benches with the audience. They attended Blumenbach's course on natural history in the winter of 1786.

In 1791-92 Blumenbach made a journey to England, or rather to London, which he afterwards used to say was to the sixth part of the world.

Blumenbach, some years after he had written his paper *On the Teeth of the Old Egyptians, and on Mummies*, had an opportunity on February 18, 1791, during his stay in London of opening six mummies, and derived considerable reputation from his communication to Sir Joseph Banks, then President of the Royal Society, on the results he obtained therefrom. (Philos. Trans. 1794.) While being entertained in London by all the English professors, they one evening took him to the theatre. The actor Kemble played the part of the

Moor of Venice. Some days after Kemble met Blumenbach at a party and said: "M. Blumenbach, how did you think I succeeded in representing the character of a negro?" "Well enough as far as the moral character goes," said our naturalist, and then added: "But all the illusion was destroyed for me the moment you opened your hand, for you had on black gloves, and the negroes have the inside of their hands a flesh colour." Everyone laughed except Blumenbach, he had spoken quite in earnest.

Blumenbach dedicated the third edition of his chief work *De generis humani varietate nativa* (Göttingen, 1795) to Sir Joseph Banks. The preface reads as follows:

> There are many reasons, illustrious Sir, why I ought to offer and dedicate to you this book, whatever it may be worth. For besides my wish to express, some time or other, my sense of gratitude for the innumerable favours you have conferred upon me from the time I came to have a nearer acquaintance with you, this very edition of my book, which now comes out with fresh care bestowed upon it, owes in great part to your liberality the splendid additions and the very remarkable ornaments in which it excels the former ones. For many years past you have spared neither pains nor expense to enrich my collection of the skulls of different nations with those specimens I was so anxious above all to obtain, I mean of Americans and the inhabitants of the islands of the Southern Ocean. And besides, when I visited London about three years ago, with the same generous liberality with which you extended the use of your nursery to our Jaertner, and other riches of your Museum to others, you gave me in my turn the unrestricted use of all the collections of treasures relating to the study of Anthropology in which your Library abounds. I mean the pictures and the drawings, etc. taken by the best artists from life itself. So I have been able to get copies of them and to describe whatever I liked, and at last, assisted by so many new and important additions, to proceed to the recasting of my book, and am bold enough to say, now that it has been amplified in so many ways, without incurring any suspicion of boasting, that it has been polished and perfected as far as its nature permits.
>
> Accept then graciously this little work, which is so much in fact your own, and I hope that in this way it will not be displeasing to you because it treats of a part of natural history, which, though second to no other in importance, still has most surprisingly been above all others the longest neglected and uncultivated.

All subsequent anthropologists, including Lawrence, Prichard, etc., have acknowledged their obligations and proved them, especially

Lawrence, by borrowing largely from Blumenbach's treatise *On the Natural Variety of Mankind.* Blumenbach's reputation as a learned man was so great that every hint of his was considered and followed up, and his works, especially his handbooks, stood in such esteem that authors and booksellers alike considered a preface from him as the best recommendation for their work. In this way he introduced:

Cheselden, *Anatomie des menschlichen Körpers.* Aus dem Englischen übersetzt von Aug. Ferd. Wolff, nebst einer Vorrede von Blumenbach, Göttingen, 1790.

Blane, *Elemente medicinischer Logik*, etc. Aus dem Englischen übersetzt von V. A. Huber. Mit einer Vorrede von J. F. Blumenbach, Göttingen, 1819.

Blane wrote as follows:

> The doctrine of that most respectable physiologist, Dr. Blumenbach, who refers generation and growth to what he calls the formative nisus, is perfectly consistent with reason; inasmuch as it is to be considered rather as an exposition of facts than as a theory. (*Elements of Medical Logik*, London, 1819, p. 24.)

Some of the most important works of Blumenbach were translated into English, viz.:

An Essay on Generation. Translated from the German by A. Crichton, Lond. 1793.

Elements of Physiology. Translated from the original Latin, and interspersed with occasional notes, by Charles Caldwell, Philadelphia, 1795.

A Short System of Comparative Anatomy. Translated from the German by William Lawrence, Lond. 1807.

Manual of Comparative Anatomy. Translated from the German with additional notes by Wm. Lawrence, 2nd edition revised and augmented by W. Coulson, Lond. 1827.

A Manual of the Elements of Natural History. Translated from the German 10th edition by R. T. Gore, Lond. 1825.

The Institutions of Physiology. Translated from the Latin of the third and last edition with notes by John Elliotson, 2nd edition, Philadelphia, 1817, 3rd edition, Lond. 1820, 1828, 4th edition, 1828. Among the many editions and translations of this work, Blumenbach set the most value upon the edition

of Elliotson's translation published by Bentley, London, 1814, because this was the first book which was ever printed entirely by a machine.

Astley Cooper, in 1839, said in a letter of recommendation, that King George IV had declared that he had never seen so imposing a man as Blumenbach.

Evidence of Blumenbach's lasting reputation in Britain has been given by the publication of the Royal Anthropological Society of London: *The Anthropological Treatises of Johann Friedrich Blumenbach*, late Professor at Göttingen and Court Physician to the King of Great Britain. With memoirs of him by Marx and Flourens and an account of his Anthropological Museum by Professor R. Wagner, and the Inaugural Dissertation of John Hunter, M. D., on the Varieties of Man, translated and edited from the Latin, German and French originals by Thomas Bendyshe, London, 1865.

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IS THE STING RAY'S STING POISONOUS?

A Historical Resumé Showing the Development of our Knowledge that it is Poisonous

E. W. GUDGER

Introduction

There are two families of sting rays particularly to be considered herein—the Trygonidae and the Myliobatidae. Their characteristics which concern us may well be set out at once. The Trygonidae, Stingarees or Sting Rays proper (Fig. 1A) have the triangular pectoral fins confluent with the head and snout and have a flexible tail varying from fairly short to very long. This tail is generally thick at the base, and in some sting rays it is decidedly club-shaped. It lacks a small fin on the base, but has one or more dorsal spines situated some distance out on the tail. The Myliobatids or Eagle Rays (Fig. 1B) are also sting rays. Their broad pectoral fins are not confluent with the head and snout. The long slender flexible tail is not thick at the base, has a dorsal fin on the base close to the body, and just behind this are one or more dorsal spines. Both kinds of rays propel themselves through the water with graceful bird-like strokes of these wide pectorals.

Both Trygonid and Myliobatid rays are marine forms. I have taken both kinds in brackish water (where they had probably gone to feed). Some Trygonids ascend rivers, but so far as I know none live permanently therein. However, we shall see later that rays of a family, Potamotrygonidae, very closely akin to the Trygonids, are permanent fresh-water dwellers. These are to-day considered by many systematists to be merely aberrant Trygonids.

Since the Trygonids have strong muscular flexible tails, with spines placed a considerable distance out on them, it is clear that they have a much greater radius of tail-activity than the Myliobatids, which have slender tails with the spine or spines only a few inches from the body. Thus the sting rays strike with great celerity and efficiency, while the eagle rays have more or less to throw the

rear end of the body (Fig. 1B) toward the person attacked. The great majority of wounds are inflicted by Trygonids and not by Myliobatids. This is true of the cases considered herein.

The common sting ray was well-known to the ancients, who called it Pastinaca or Trygon—the latter name in allusion to its broad triangular pectoral fins (Fig. 1A). The spine was known as a formidable weapon when wielded by the fish. When a large spine was fastened to the end of a pole or rod, it made a dangerous weapon against a man unprotected by armor. The early explorers in the South Seas found such spears in use, as they are in some islands there to-day, and as late as 1931 such spears were in use in various parts of South America. Even to-day sting-ray spines are used for arrow points by the Indians of our southern continent.

From classical times to the present, the question whether the spine of the sting ray is poisonous has been asked of those having knowledge of these rays. It has frequently been put to me and I have long had it in mind to study the matter and endeavor to answer it. Recently one of the editors of the Journal of the American Medical Association asked me to prepare a brief answer to such a query sent to the Journal. This I did and the note appeared in the issue of Nov. 22, 1941. But the interest aroused in that brief study has led me to go into the matter more deeply and this article is an endeavor to present the answer from the historical aspect, and to trace the steps by which our present knowledge has been arrived at.

The Verdict of Antiquity as to the Sting of Pastinaca or Trygon

The sting ray was well known to the ancients. Aristotle (384–322 B. C.) in his *Historia Animalium* (first published at Venice, 1476) calls it the sting ray, and also Trygon ("three-angled") so he evidently knew the shape of the fish and the fact that it is armed with a spine. But, strange to say, he nowhere refers to the use of the sting, much less to its alleged venomous properties.

However, this omission cannot be charged to Pliny (23 B. C.–79 A. D.) for in Book IX, Chapter 72, of his *Naturalis Historia* (first published at Venice in 1469), he says that ". . . there is nothing that is more to be dreaded than the sting which protrudes from the tail of the Trygon, by our people known as the Pastinaca, a

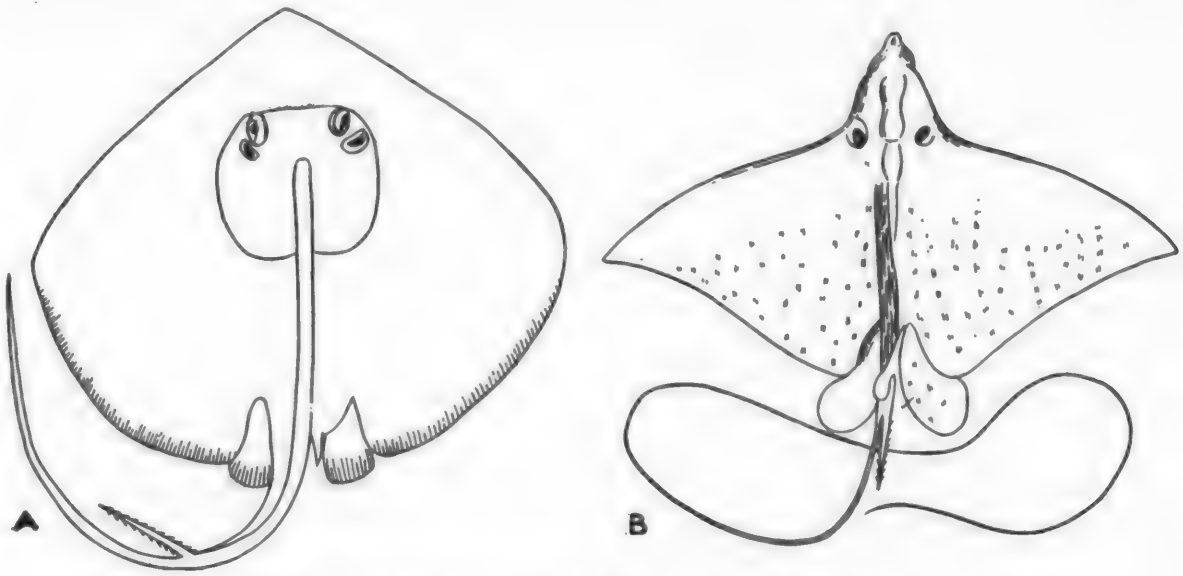

Fig. 1. Semi-diagrammatic Figures of a Trygonid and a Myliobated Ray.
1A. The common European sting ray, *Pastinaca marina* or *Trygon pastinaca*.
1B. The widely distributed spotted eagle ray, *Aetobatus narinari*.

weapon five inches in length. Fixing this in the root of a tree, the fish is able to kill it; it can pierce armour too, just as though with an arrow, and to the strength of iron it adds all the corrosive qualities of poison." Just why the account should have the fish drive its spine into the root of a tree growing out on the land, instead of into the leg of a fisherman standing in the sea, I do not understand. However, in chapter 67 of the book referred to, Pliny also notes that: "The pastinaca . . . lies lurking in ambush, and pierces the fish as they pass with the sting with which it is armed."

It is somewhat extraordinary that neither of these natural historians gives any account of hurts to men by attacks of the ray. They must surely have known of such attacks. Be that as it may, it is of record that the sting ray and its baleful activities were known to at least two later classical writers.

The first, Aelian (flourished *c.* 120 A. D.), seems to have known the Mediterranean sting ray well. In his book, *De Natura Animalium* (first published, Lugduni Batavorum—Leyden—in 1533), he speaks of it no fewer than seven times.

Aelian names various fishes which have venomous spines, but says that of all of these the "Pastinaca marina" is provided with the "infectissimo ac periculosissimo aculeo." He repeats Pliny's story of the effects of the spine on a green tree—it withers, sheds leaves and flowers, and dies. Then he adds that by means of its spine, the fish has the power very quickly to bring death to men and animals, but he does not expressly say that it is poisonous.

Next Aelian quotes one Leonides Byzantius that—A man, mistaking a Pastinaca for a Turbot, stole it from the net of a fisherman and hastened to the market to sell it. To avoid detection, he concealed it under his clothes, but, feeling it move, he held it even closer to his body. The story goes that in his haste he tripped and fell to the ground in such a way that the sting was driven into his body. At any rate, Leonides says that the man was found dead with the spine piercing his abdomen and with his bowels protruding from the wound. This happening confirmed the popular belief in the fatal nature of the spine, but there is no hint that it is poisonous.

Oppian (fl. *c.* 172–210 A. D.) wrote a work on fishes and fishing—*De Piscatu Libri V*, published in Latin in 1478, and in Eng-

lish translation in 1722 as *Halieuticks or the Nature of Fishes and Fishing of the Ancients.* In this he refers no fewer than seven times to "the Pois'nous Fire-Flaire" and says that "Sharp poison'd Darts [are] the dreaded Fire-Flaires aid."

Oppian compares the Fire-Flaire's dread activities with those of the Swordfish:

> The Fire-Flaire's tail its venom'd Shaft contains,
> Nor Time nor Waste the poison'd Treasure Drains.
> . . . but when the Swordfish dies,
> Extinct with him the mould'ring Weapon lies,
> Not so the Fire-Flaire's Dart, that still survives
> The dying Fish, and in its venom lives.

Then he affirms that "of all ills . . . that Seas produce or earth's dark Womb conceals, none equals that the Ray-like Fire-Flaire bears."

Of the effects on man, Oppian writes that "Circe, who all secrets knew . . . most valu'd kept the Fire-Flaire's venom'd Dart." With this she armed her son on whom she

> . . . the fatal gift bestows
> Describes its use and the hid venom shows.

The son tried out his spear, armed with the poisonous dart, on his father's goats and

> Around the Plain contagious Slaughter made,
> And in rank Heaps the bearded Victims laid.

Then, when the father comes to drive off the robber,

> With blind Rage the Parricide possest,
> Assaults his Sire and wounds his aged Breast.
> Thro' boiling veins the glowing Poisons roll
> And with dire Pains expell the ling'ring Soul.
> [Thus he] his fated End in Sea-bred Venom found,
> And from the Fire-Flaire's Dart received his mortal wound.

These quotations make it clear that the classical writers believed that the sting ray's sting carries poison. Their conclusions were not based on dissections and experiments, but they must have known of

attacks by the Fire-Flaire on fishermen. Their conclusions are backed up by certain old medical writers.

The Opinions of Early Medical Writers

One of these doctors was a contemporary of Aelian, while the other lived some hundred years later.

Dioscorides, a Greek who lived in the first century B. C., wrote a work on materia medica. Mattioli (or Matthiolus as his name was Latinized, following the usage of the time), a learned Italian physician of the 1500's, published his Commentaries on Dioscorides in 1554. In these he quotes Dioscorides that he had heard of instances of attacks by sting rays resulting in convulsions and contractions of the whole body, and finally in the deaths of the persons wounded.

Next is Aetius, who flourished in about 500 A. D. He says that wounds inflicted by the sting of the ray are followed by acute pain and deadness of the part affected, and that these symptoms spread over the whole body.

In the long years from classical times through the Dark and Middle Ages to the Renaissance, numbers of writers, particularly on medical matters, must have dealt with our subject. No citations have come to hand, and the outcome of the search for such would not repay the effort.

The Beliefs of the Renaissance Savants

The Revival of Learning in the Western World brought to maturity, in the middle years of the 1500's, five men (all medical men) who laid broad, deep, and sound foundations for the future study of the natural history of animals and particularly of fishes. These men knew, figured and quite accurately described Trygon.

The first of these, Pierre Belon, wrote the two oldest published books devoted to the scientific study of fishes. The second of these books, his *De Aquatilibus*, was published at Paris in 1553. On page 94 of this, Belon quite accurately describes, and on page 95 gives a good woodcut figure of the " Pastinaca marina," sting and all. This (Fig. 2) is, so far as I can find, the earliest published figure of a

sting ray. Of it, he says that the fishermen stand in fear of the poisonous sting (" venenato aculeo ") which is found near the root of the tail. His figure of the fish shows the spine much too large in proportion to the size of the tail. Belon adds that the spine is as long as a finger, and that it is sometimes double and even triple. Belon seems to be the first man who ever recorded this fact, although to-day it is well known to anyone who has handled any numbers of adult rays.

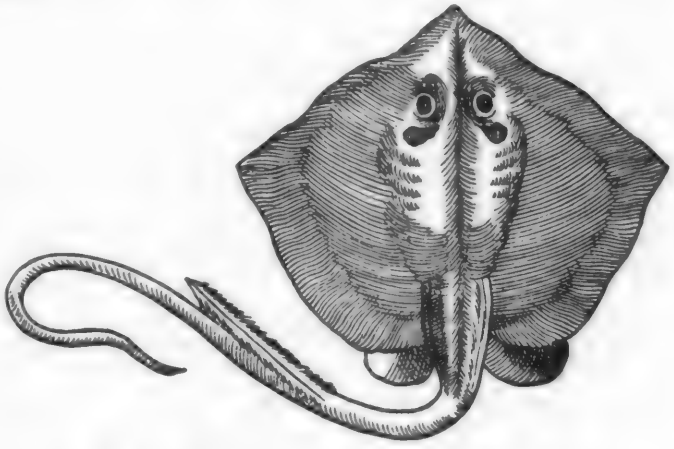

Fig. 2. " Pastinaca marina," the European Sting Ray.

Note that the triangular fins are confluent with the head and that the stout tail lacks a fin but has the spine some distance away from the body. This figure of this ray (the first published in a scientific work) has the spine drawn disproportionately large.

After Belon, 1553

The next of the Renaissance ichthyologists is Guillaume Rondelet, who was born and who spent most of his life in the university town of Montpellier, France, in sight of and only seven miles from the Mediterranean. Rondelet took his medical degree at Montpellier, became Regius Professor of Medicine there in 1545, and in 1556 was chosen Chancellor of the university. But it is as an ichthyologist, rather than as a medical man, that he is known to the world of science to-day.

In his *Libri de Piscibus Marinis*, published (Lugduni Gallorum, Lyons) in 1554, Rondelet figures the Pastinaca marina and discourses on it in seven small folio pages and in two paragraphs. His figure, having the teeth on the spine very much exaggerated, is inferior to Belon's. However, he describes the spine as pointing backward and having the edges lined with teeth which point forward toward the head of the ray. He notes that this arrangement allows the dart to penetrate readily but makes the withdrawal difficult, since it tears the flesh and make a bad wound—" when it has stung a fish, the spine holds it like a hook."

Living almost on the shore of the Mediterranean, Rondelet, an eminent ichthyologist, was well acquainted with the sting ray, and as a distinguished member of the medical faculty of Montpellier, he was well acquainted with the writings of his predecessors (including Aelian and Dioscorides) on the alleged poisonous effects of its sting. Furthermore, he describes a case of sting-ray stinging, which is very like that of Leonides Byzantius as told by Aelian, but Rondelet states that he himself cared for the man. Here is the story as best I can make it out; Rondelet's Latin is *not* that of the classical writers, many of his terms not being found in Andrews' *Latin-English Dictionary*.

A rustic from a nearby settlement was concealing a Pastinaca wrapped in a stolen cloak, when he was wounded by its dart driven in his thigh ("femore"). Fearing that he would be caught in the theft, he did not cry out with the pain but came secretly to Rondelet, telling him the whole story and showing the dart which he had extracted from the much enlarged wound. Our physician states that he ordinarily treated sting-ray wounds by applying the split liver of the fish to the wound, whereupon the pain was eased and the swelling reduced. " Thus the fish [as one old writer quaintly puts it] is seen to have in itself the antidote for its poison." Then again, he would sometimes reduce the sting to ashes and sprinkle these on the wound—with like beneficial results. Rondelet further notes that this poison (" venenum ") was known to the fishermen of the region around Montpellier, and that they ordinarily cut off the tail of the ray before bringing the fish to the market. Sometimes, however, the fish were brought in, tails and all. Since the poison is localized

in the gland under the spine (as will be shown later), the flesh is safely edible. Furthermore the spines, when incinerated and reduced to powder, were used as a medicament, not only for treating sting-ray wounds but also for various other ailments.

The Roman physician Hyppolyto Salviani, published his *Aquatilium Animalium Historiae* at Rome in 1554-58. He handles his data in very systematic fashion (dividing it into sections) and in it I had hoped to find that he had treated cases of sting-ray wounds, but the search was a vain one. However, it is plain that, from his study of the writings of his predecessors, he was convinced that the after effects of a stroke by the fish are produced by a poison.

The learned Swiss, Conrad Gesner, published "Liber IIII" (*sic*) of his encyclopedic *Historiae Animalium* (Tiguri = Zurich) in 1558. In this great folio, Gesner devotes eight pages to Pastinaca marina. He had examined a dried specimen but had never seen a live or just-caught ray. However, he had assiduously studied the writings of his predecessors—those noted above and also others—and was firmly convinced that the sting of this ray is poisonous. He gives figures of the tails of two long-tailed rays, each with two spines, the earliest illustrations known to me of sting-ray tails with multiple darts.

The greatest of all the encyclopedists was Ulyssis Aldrovandi, whose huge folio volume *De Piscibus* appeared at Bologna in 1613. In this he has ten pages (divided into various sections) devoted to Pastinaca marina. Of the conclusions of this author on the matter under study, Dr. H. Muir Evans (to be referred to presently) says:

> Aldrovandi endeavored to shake off the yoke of antiquity, and adopted an attitude which is found even in modern writers. 'I have searched,' he says, 'for a poison organ in Trygon and have not found it; therefore it does not exist,' [and proceeds to state that] 'These fish are dangerous only on account of the mechanical wounds they make and the depths to which their spines penetrate.'

This is identical with and undoubtedly quoted from Marie Phisalix's *Animaux Venimeux et Venins*, Paris, 1922, vol. I, p. 490.

Seeking to verify this, I have gone through Aldrovandi's text, line by line, without finding it. Aldrovandi nowhere uses the word Trygon, not even in his section "Synonyma." He uses only the name Pastinaca. He has a section, "Veneni Vehementia et Cura," in

which, like Salviani and Gesner, he reviews the work and conclusions of his predecessors. At the foot of this, I confidently expected to find the statement above, but not so. In addition to the searchings noted above, I have made line-by-line and word-by-word examinations of this particular section, and the only conclusion to which I can come is that Aldrovandi, like the other writers mentioned herein, believed that the sting of Pastinaca is poisonous.

It would be a great time-consuming task to search through the literature from the Renaissance to the beginning of the nineteenth century. In a desultory reading it has been found that the fishermen are everywhere quoted that the stinging is followed by great pain and swelling. They uniformly believe that this is due to a poison conveyed by the spine.

From European Trygonid rays, which (as far as I can find) never go into fresh water, we now turn to the closely-related South American Potamotrygonids, which seem never to go into salt water. They are found in the Orinoco and other northern rivers of this continent, and in the Amazon and La Plata and their tributaries. The family is appropriately named Potamotrygonidae, or Trygonids that live in rivers (Gr. *potamos*, a river). These Potamotrygons are none too well known and separated as to species. But from Garman's *Plagiostomia* (1913), I have been able to designate the two forms of most interest to my readers.

With the exception of the fishes described in a few incidents to follow later, all the rays whose attacks are referred to from this point onward are Potamotrygonids from South American rivers. Hence it is appropriate to figure such a representative ray that the reader may contrast it with those portrayed in Figs. 1A and B. As may be seen in Fig. 3, these rays are not three-angled but round or at best subtriangular. It is noticeable that the disk is spotted or reticulated with colored markings (true in all species). Like the Trygonids proper, all these fresh-water rays have the broad pectoral fins confluent with the head and snout, all have tails with stout bases but lacking a dorsal fin, and all adults have the spine or spines placed far out toward the tip of the tail. This has led to the conjecture

by various authorities that these tails have been mutilated—probably by the fierce and voracious Characin fishes (Piranhas) living in the same waters.

Proofs in the 1800's—Early and Late—From Attacks by the River Ray, Potamotrygon histrix

So far as I can find, the earliest observer who accurately described the symptoms of a sting-ray wound and drew sound conclusions therefrom, was Richard Schomburgk, who travelled extensively in British Guiana in 1840–44. He made many interesting and valuable natural history observations on the animals encountered and, pertinent to our subject, he notes in his book (1848 and 1923) that sting rays abound in the rivers of British Guiana and that they imbed themselves in sand and mud so that only the eyes are free.

On the Takutu River, 1842.—Schomburgk's Indians feared the rays greatly and when wading in streams always probed the bottom ahead of them with paddles or sticks to drive the rays out. However, in spite of their precautions, two of his men were stung while descending the Takutu River.

> Awacaipu was wounded twice on the instep by one of these fish [probably having two spines] . . . he staggered on to the sandbank where he collapsed and, biting his lips with the raging agony, rolled about in the sand. While engaged in trying to alleviate his sufferings . . . our attention was distracted by a loud shriek from . . . Cumeru . . . whose wound had been inflicted [by another ray] . . . and who with a piercing cry of suffering threw himself about on the ground, dug his face and head into the sand, and even bit into it. I have never seen an epileptic suffering from convulsions to such an extent. Although Awacaipu had been [twice] wounded on the instep, and Cumeru on the sole of the foot, both felt the greatest pain in the privates, the neighborhood of the heart and under the armpits. The fits were apparently bad enough . . . [but] they took on such a serious turn with the boy [Cumeru] that we were forced to believe the worst. After getting the wounds sucked out, we tied ligatures, used a wash of laudanum, and then applied continuous mollifying poultices of cassava bread. The symptoms had very much the resemblance of those accompanying snake bite. It is impossible that this absolute nervous breakdown can proceed from mere wounding alone; very probably it must be ascribed to the poison combined with it. A powerful and lusty laborer who, shortly before our departure from Demerara, was struck by a sting ray . . . died in the most awful convulsions.

Schomburgk adds that the next day the sufferings of his patients had somewhat subsided, but they were still not able to use their feet. Hence it was necessary for them to remain in the dugouts not only in smooth water but even when they were descending rapids.

Here, written a hundred years ago (April, 1842), is a careful clinical report from a trained scientific man of two sting-ray attacks which he witnessed, and the victims of which he personally cared for. The account of the behavior of the stoical Indians, whose lifelong training was that expressions of pain were evidence of weakness on the part of warriors, lends weight to Schomburgk's report. His conclusions that the wounds were poisoned are perfectly sound. Had these conclusions become known to scientific men, they would have gone far toward settling our question long ago. But merely comprising some paragraphs in his book, they have long remained unknown.

Richard Schomburgk neither figures nor describes the rays which wounded his men. But this was done for several rays in Guiana waters by his brother, Robert H. Schomburgk, in 1843. He figures in color a two-spined ray from the Takutu River. This he states has poisonous spines which produce fevered wounds very hard to heal. Along with his figure, Schomburgk reproduces (behind his drawing) D'Orbigny's colored figure of *P. histrix* and it is presumed that the two are identical. Fig. 3 herein is reproduced from Robert Schomburgk. It is a good representation of the rays of the family Potamotrygonidae.

On the Orinoco, 1881.—The next account is of attacks that occurred in the Orinoco, a river neighboring to that traversed by Schomburgk. This statement is interesting and valuable because it confirms what Schomburgk wrote of his patients. The attacks now to be described came as Dr. J. Crevaux and companions were descending the Orinoco early in July, 1881. For a full account, see Crevaux (1882).

A sailor member of the party, wading one morning from the shore to the canoe, without prodding for the rays, was struck in both feet—on the inner side of the right heel, and at the extremity of the left fourth toe—both wounds being small. These wounds were at once sucked and then cauterized with carbolic acid. The venom seemed to

affect the lymphatics of each leg as could be readily seen. The wounds were deeper than was thought and the acid evidently did not destroy all the venom. The rugged sailor moaned like a child and frequently leaped from his hammock in order to arouse his benumbed legs. But the least touch provoked a new crisis. Crevaux then debrided the wound and followed the advice of an old Carib woman by bathing it with tobacco juice. It was then noted that the pain recurred only at longer intervals. To the natives, this augured favorably for the patient's recovery, but they said it would take three or four weeks. They alleged that the wound would probably become surrounded with a bluish area; that this would become insensitive and that sloughing would be followed by formation of a scar like that from a burn.

But the agony, which had ceased after midday, returned early the next morning and with loud cries the sailor demanded surgical relief. There was considerable edema in the regions of the wounds, with almost full closure. Deep incisions led to the draining of a considerable amount of serum, and the patient experienced much relief. However, later the symptoms became general. The man passed the second night lying on a sandbank and was delirious all night long. The next morning, forty-eight hours after the attacks, the edema and the large cyanosed patches which had covered almost all the surface of both feet the day before were seen to have reached to the abdomen. It was then decided to move the patient down the river about five kilometers to an Indian village, where he could be better cared for. But on the way, in the midst of a violent squall, he died. His death evidently came as a result of a poisonous substance carried into the wounds by the darts of the rays.

This expedition was Dr. Crevaux's third in tropical America, and on at least one of the others he had seen a sting ray's attack on a man. He (a medical man) had charge of this last patient for the forty-eight hours from the attack till death came. It was too short a time for gangrene or any other bacterial infection to carry off the patient, and Dr. Crevaux does not allude to such. The man surely died of the poison derived from the glands of the two rays—the second recorded case (see Schomburgk for the first) of a death indubitably caused by the sting of a ray.

It should be noted specifically that Crevaux's sailor received two wounds, and that one of Schomburgk's Indians was wounded twice. The sailor died in forty-eight hours, plainly poisoned. The Indian, suffering like an epileptic with a hard attack, escaped with his life. The evidence adduced by Schomburgk and Crevaux is that the sting surely conveys a poison to the victim; and the two stings carry presumably twice as much. One sting may cause death, two almost assuredly will. Then how about a multiple stinging by such a lethal apparatus as that shown below in Fig. 5? This point will be taken up later.

It is now necessary to leave behind for a while the Potamotrygonid rays and their attacks in order to take up, in the chronological order of a historical paper, various topics (attacks of other kinds of rays among them) which must now be considered. Eventually we will return to and will conclude this article with a further and final study of other South American fresh-water rays and the action of their venoms.

Results of a Puncture by the Sting of Trygon violacea

This brief but pertinent observation of a sting by this marine ray was made by Lo Bianco in the Naples Zoological Station in 1899. It is deeply buried in a long report (alphabetical, under the names of the animals) on the periods of sexual maturity and breeding of animals in the Gulf of Naples.

After giving the data on breeding for *Trygon violacea*, Lo Bianco relates that he had observed a young man who, in passing from one person to another a small ray of this species weighing about six pounds, received a small puncture. Lo Bianco noted that the young man became very pale and in a few minutes fell senseless to the ground.

Attacks by Myliobatid Rays

The attacks described up to this point have been made by Trygonids and Potamotrygonids. It is commonly believed and said that the Myliobatids also have poisonous stings. I suspect that attacks by such rays are not very common. This is in part at least due to

the fact that the spine (or spines) is found at the very base of the tail and close to the body of the ray, as may be seen in Figs. 1B and 4. To inflict a wound such a ray would have either to be very close to the person attacked or would have to throw its body in his direction.

The few attacks by these marine rays must be briefly considered here since the stings are poisonous and since this is their place in the chronological order. All so far as found have been made by the spotted eagle ray, *Aetobatus narinari* (Fig. 4). The early accounts have been synopsized in my paper on this ray (Gudger, 1914, pp. 298-300). All who have written on this subject, from Abbeville (1614) to Lichtenstein (1844), say that the spines contain a virulent poison and that anyone wounded by such will suffer great pain, and one author states that this may bring about paralysis. All these accounts are lacking in details.

Referring to the spines shown in Fig.5, the question is raised, "Does Aetobatus often have more than one spine?" And also, "If so, what are the results of an attack with such multiple spines?" The first question is answered by my article. Here an enumeration is made of spine-counts for sixteen specimens listed in the literature and the eight specimens examined by me at Beaufort, N. C., and at Key West, Fla. Four specimens had 1 spine each, nine had 2 spines, four had 3, five had 4, and two had 5 spines.

Since multiple spines predominate in Aetobatus, these may make its attacks more dangerous. However, my fishermen at Beaufort were much less afraid of Aetobatus with several spines close to the body than of Dasyatis with one spine out some distance on the tail. I found it dangerous to pick up an active Dasyatis by putting thumb and fingers in the spiracles. Not so, however, Aetobatus, which offered much less resistance and made comparatively little effort to strike the handler. My judgment is that men are not often stung by Aetobatus or any other Myliobatid ray—all with spines close to the body. But it seems clear that if a man is stung by an Aetobatus with two spines, he will (other things being equal) receive twice as much poison as if he had received but one stab, and with proportional bad results. In fact the results would be expected to approximate those

in the case of Schomburgk's Indian and Crevaux's sailor, each of whom received two strokes.

The stingings by Aetobatus, as recorded in the old literature, have been referred to above. Two later-day accounts have come to hand. The only attack I know of personally was reported to me by the late R. J. Coles, a former member of this Museum. In July, 1910, at Cape Lookout, N. C., in clearing a net, he had a large spotted ray drive its single spine two inches or more into his leg. He told me that he suffered agonies, but having at hand a syringe for injecting fishes, he thoroughly washed out the wound with a strong solution of formalin. The pain ceased shortly and the wound healed normally and fairly quickly.

One later account is by John D. Gimlette, who has had much experience with poisonous rays in Malaya, as recorded in his book, *Malay Poisons and Charm Cures* (London, 1923, p. 120). He says that "*Aetobatis narinari* [the spotted eagle ray]" . . . is known to cause severe symptoms of poisoning. Violent pain and faintness precede rapid local swelling about the puncture which quickly becomes the seat of violent inflammation and perhaps gangrene."

Had the observations of Lo Bianco (1899) and particularly those by Crevaux (1882) and Schomburgk (1848) been published in short articles with definitive titles and thus become widely known, the question whether the sting ray's sting is poisonous would have been settled nearly a hundred years ago. But as has been shown, their accounts were all securely hidden in their general publications for all these long years. Lacking this knowledge, we have the following considered statements of the status of the problem in 1904–10.

The Pronunciamentos of the Authorities, 1904–1910

In the *Cambridge Natural History* (1904, vol. VII, p. 177), G. A. Boulenger thus summed up our knowledge as of 1904: "Among the Elasmobranchs, the Eagle-Rays (*Aetobatis*) and the Sting-Rays (*Trygon*) have barbed or serrated spines on the tail which inflict wounds far more severe than those caused by mere mechanical laceration; but, except the mucus secreted by the gland cells of the

Fig. 3. *Potamotrygon histrix*, an Almost-Round Fresh-water Sting Ray of South America.

The rear figure is copied from D'Orbigny. The ray in front is from the Takutu River. Note its two spines. It was probably a ray of this species that wounded Richard Schomburgk's Indian attendant.

After Robert H. Schomburgk, pl. 20, 1843

Fig. 4. The Spotted Eagle Ray, *Actobatus narinari.*

Note that the pectoral fins are not grown fast to the head and that the slender tail (here cut off) has a small fin and behind it a spine—both close to the body.

Photograph by E. W. Gudger

skin, which may possess venomous properties, no special poison-forming glands in connection with the spines are at present known."

And on our side of the Atlantic, David Starr Jordan (*Guide to Study of Fishes*, 1905, I, p. 182) states that "There is no evidence that these spines bear any specific poison, but the ragged wounds they make are always dangerous and often end in gangrene. It is possible that the mucus on the surface of the spine acts as a poison on the lacerated tissues, rendering the wound something different from a simple cut." This opinion was held by E. Ray Lankester as late as 1910, and is expressly stated in his *Science from an Easy Chair* (p. 107), and in 1925, Jordan reiterates his statement above in his *Fishes*.

Such then was the status of our knowledge (or better, belief) in 1904–10. Jordan's (1905, 1925) and Lankester's (1910) statements were probably echoes of Boulenger's in the *Cambridge Natural History* (1904).—Old errors die hard, but there were signs of the coming dawn.

Personal Observations, 1902–1915

In June, 1902, I began at the U. S. Fisheries Laboratory at Beaufort, N. C., the study of rays which ended there in 1911, but which was continued at the Carnegie Marine Laboratory at Tortugas, Florida, until August, 1915. In that time I handled scores of sting rays but was never hurt. However, it is recalled that on one occasion a large stingaree was impaled on a pike to be transferred from the fishermen's net to my boat. As it came over, it lashed out viciously, missed me narrowly but drove the spine into the side of the boat so deep that it could not be pulled out. The tail was cut off and even then the spine had to be broken off, leaving the point in the wood. At a later date, by Caesarean section, I took from the uterus of a female ray an embryo which lashed out at my hand with its tail, but the spine was too little calcified to do other than merely prick my thumb. The incident, however, illustrates the ruling passion latent in the unborn young of the sting ray.

During all those years my interest in these rays was concentrated in their reproductive organs and breeding habits. However, many fresh stings were dissected out, cleaned and preserved. But I found

in the tail at the base of the spine nothing faintly resembling a poison gland, and I did not recognize such a gland in the masses of black tissue filling the grooves on the under side of the spine back to its base. Since my hands were always cut and bruised from handling nets and fishes, it is surprising that I did not get poisoned.

When often asked about the poisonous properties of the sting, having found no poison gland and being ignorant of the literature of the subject, the stereotyped reply was given as to the probable poisonous properties of the mucus, and it was emphasized that caught in this were innumerable bacteria which might cause infection.

However, at Beaufort, several fishermen who had been stung (one at Cape Lookout) described to me the almost immediate and unbearable pain, accompanied by great swelling, dizziness, etc., which followed the driving in of the spine. This of course threw out any possibility of bacterial action. Furthermore, in handling many rays I had gotten the slime of the skin into cuts and bruises with resulting mild annoyance, but nothing worth speaking of.

If the literature (noted above) had not been overlooked, I would have searched for and found the gland. However, it was later learned that a poison gland had been found at the root of the spine, and since the groove on the dorsal surface of the spine is very marked, I erroneously concluded that the glandular secretion passes down it. Accordingly I published in the Australian Museum Magazine (1937) figures of dorsal and ventral surfaces of sting-ray spines and unfortunately stated that the secretion flows in the dorsal groove. But, unknown to me and to the authorities noted above, studies had been begun, which, together with later researches, were to clear up the whole matter. These studies will now be reviewed.

Discovery of the Poison Gland, 1905–1916

In 1904, Antonio Porta made an anatomical study of the poison apparatus in various fishes—among them a Trygon and a Myliobatid. He gives (1905) six figures of whole spines and two very poor sectional views through spine and glands of Trygon, and crudely describes glandular structures in the ventral lateral grooves of the sting. His paper is not devoid of errors—*e. g.* that the spine is shed

every year. Since this is rather commonly believed (particularly on the authority of Robert Schomburgk) and since it is a matter of some interest and importance, it seems well to clarify it before going further.

Quoy and Gaimard in 1824 figured a five-spined tail from a South Sea ray which they called *Raja quinqueaculata*, but which was surely a Myliobatid. So far as I know, this tail had more spines than any ever figured. At Beaufort, N. C., there was presented to me a four-spined tail of the spotted eagle ray, *Actobatus narinari*. I have photographed this tail and spines alongside Quoy and Gaimard's figure, and both sets of spines may be seen in Fig. 5. As this figure shows, the oldest spine is the hindmost one and the one nearest the dorsal fin the youngest. From these figures and from long observation, I am sure that the spines continue to grow at the base throughout the life of the ray or until torn out by accident. Furthermore, I once collected at Beaufort a *Dasyatis say* (the ordinary sting ray) with either three or four spines—the most anterior broken but the others perfect. However, in the long years, this specimen has disappeared. But I also collected there and still have the tail of an ordinary Dasyatis, which (presumably by the bite of a shark) has been broken just under the middle of the spine. At the same time the spine was broken and distorted. Tail and spine have healed but the hinder half of the spine is markedly below the size of the basal part. This hurt must have been done in youth when tail and spine were still soft and pliable. These tails and stings plainly indicate that the sting grows indefinitely from the root. As will presently be shown, this makes for permanency in the poison organ and for its progressive growth in size and presumably in virulence.

In Fig. 6 are shown three spines—A is a dorsal view of the sting of *Dasyatis say*, B, a ventral view of a sting of a ray of the same species, and C, a ventral aspect of a sting of the Eagle Ray, *Actobatus narinari*. In its manner of growth from the tail of a ray, the sting closely parallels that of a man's finger nail. It grows out from a matrix and on the dorsal surface the tissues come to a rather sharp limit (Fig. 6A). But, on the side next the tail, the tissues adhere for some distance to the underside of the spine as they do to the underside of the nail in a man's finger. Note the evidence of these

Fig. 5. Multi-spined Tails of Two Myliobatid Rays.

The upper is a tail of a specimen from the South Seas. After Quoy and Gaimard (1824). The lower tail is from an *Actobatus narinari* taken at Beaufort, N. C., U. S. A. Note on each specimen the presence of a small dorsal fin in front of the spines—of which the most posterior is the oldest.

Photograph by E. W. Gudger

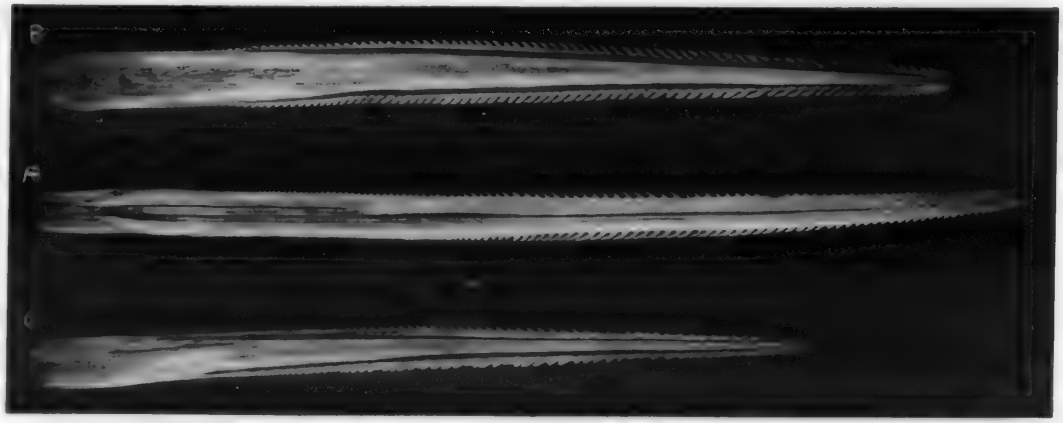

Fig. 6. Spines of Two Kinds of Sting Rays from Beaufort, N. C.

A, dorsal; and B, ventral surface of spines of *Dasyatis say*; C, ventral aspect of a bi-pronged spine of *Actobatus narinari*. On the ventral surface of each spine note the median ridge and, on either side between this and the teeth, a marked lateral groove.

Photograph by American Museum of Natural History.

things in the scars or impressions on the roots of the spines of Fig. 6, and also in the tail with spine in Fig. 7. Note in Fig. 6B and C and in Fig. 7A and B the central ridge and the lateral grooves on the ventral surface. These figures serve as an introduction to what is to follow.

To Porta belongs the credit for initiating the study of the poison gland of the sting rays. But it is Dr. H. Muir Evans at Lowestoft Hospital, England, who definitely established our knowledge of the gland and of how it produces the poison.

Evans, in the years 1906 to 1924, published eleven papers on various poisonous fishes and their spines. At least three of these articles deal specifically with or include Trygon. I find these articles somewhat difficult to follow and, since the matter is of great interest, it seems best to quote our author's words, so far as possible, and to reproduce a number of his figures.

The relation of tail and spine is shown in my Fig. 7 (his Fig. 3, 1916). Above the tail is the dorsal spine, below is the remnant of the ventral lobe of the caudal fin. On the underside of the spine may be seen the dark mass of the poison gland. In life the upper surface of the spine is covered with a thin dark epidermis, below are the much blacker and thicker tissues of the poison gland. In order to photograph the spines (Fig. 6), it is necessary to remove the tissues noted. Generally I have done this by scraping with a knife and a stiff brush.

In Fig. 7, A and B are cross-sectional views, which further make clear the relations of tail and spine. In A is shown the spine near its base, with its ventral median ridge; on each side is the dark mass of the gland, and bordering these the serrated margins of the spine. In B the spine is seen free from the tail. Note that in A and B all the soft tissue filling each lateral ventral groove is labelled " glandular tissue."

My Fig. 8 (Evans, 1924a, Fig. 1) is of an enlarged cross section which shows the tissues in some detail. Here on either side of the median ridge one sees these tissues filling most of the ventral part of each groove. The bottom (really the top) of each groove is filled with alveolar connective tissue. Ventral to this is the glandular structure with its columns of secretion directed towards the ser-

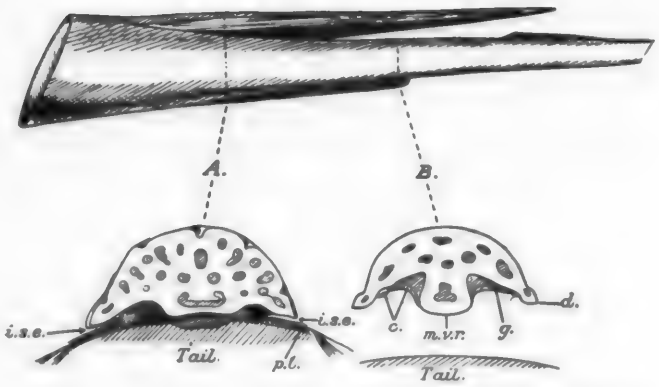

Fig. 7. Lateral View of Tail and Spine of the European Sting Ray, *Trygon pastinaca*.

A and B are diagrammatic cross-sections at the levels indicated; *c*, canals; *d*, tooth; *g*, glandular tissue; *i. s. e.*, invagination of specialized epithelium; *m. v. r.*, median ventral ridge; *p. l.*, pigment layer.

After Evans, fig. 3, 1916.

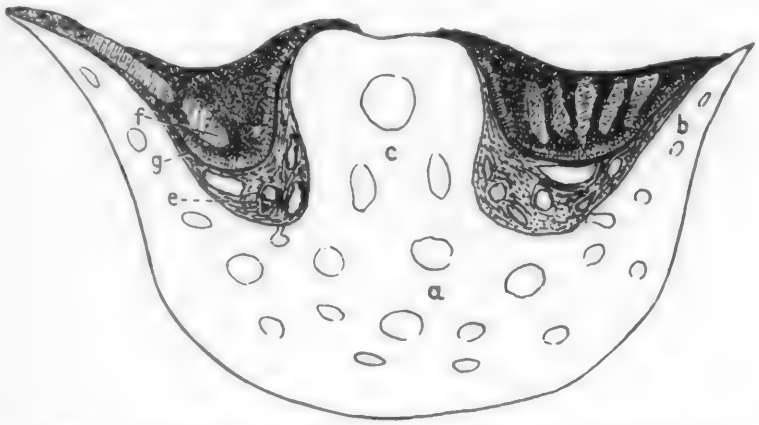

Fig. 8. Semi-diagrammatic Transverse Section of Spine and Poison Glands of *T. pastinaca*.

a, vasodentine; *b*, dentate margin of spine; *c*, median ridge; *e*, alveolar connective tissue of lateral groove; *f*, glandular portion with columns of secretion directed toward denticle; *g*, pigmented capillary layer.

After Evans, fig. 1, 1924a.

rate edge. A lateral groove and its contents still more enlarged is portrayed in Fig. 9 (Evans, 1924a, Fig. 1a). Plain here is the pigment layer made up of capillaries with pigment cells in their walls. Dorsal to this layer is a mass of connective tissue with large alveoli. Ventral to the pigmented layer of cells are the epithelial cells, some much distended with secretion—the poisonous product.

Further on, Evans states that "Blood vessels course through the length of the gland and there are two large channels, appearing throughout the series of sections, lying just beneath the pigment layer and often bulging this layer outwards." These are not shown in Fig. 9, but as Evans also refers specifically to his Fig. 2 (1924a), this is reproduced as my Fig. 10. Here, near the center of the groove is seen a small number of gland cells, those in the deeper layer being cylindrical, the others ovoid.

More explicitly, Evans writes (1916, pp. 436-437):

> If now we examine more carefully the secreting tissue of the glandular triangle, we notice throughout the length of the groove, but more markedly near its base, two definite rounded cavities, occupied by a mass of homogeneous material staining yellow by Van Giesen's method. These cavities tend throughout the whole series of sections to arrange themselves into ducts or canals, one lying near the center of the gland or towards the ridge, and the other lying towards the lateral margin in the direction of the teeth. The follicles seem to empty themselves either into one canal or the other. As each duct or canal becomes filled with secretion it bulges the pigment-layer so as to make it protrude externally. On the peripheral margin of the lateral canal this bulge is surmounted by a curious nipple-shaped projection [my Fig. 10] which appears throughout the whole series of sections, at times distended, at times empty and flattened. Some of the sections show the nipple discharging a fluid from its tip, and one feels convinced that these sections actually show the secretion from the lateral canal being discharged externally. Towards the tip of the spine, where the groove is smaller, the nipple is prolonged into a filamentous tube.

These things are seen in my Fig. 10 (Evans' figure 2 of his 1924a paper). This figure and its caption will make things clearer.

Evans has a diagrammatic figure (reproduced as Fig. 11) showing the grooves, the secreting cells, the central and lateral canals, and the nipples. Note the juxtaposition of nipples and teeth on the spine, there being at least one nipple for every serration. As to how the

poison is transferred, our author goes on to state (1916, p. 438) that when the spine is driven into the flesh of the victim, pressure is exerted on the gland, canals, and nipples, and:

> In this way the dentate margin is moistened with secretion, and as the teeth lacerate the tissue of the victim the poison becomes inoculated in the wound. Towards the tip of the spine there is little glandular tissue: the central canal divides into two or more channels, and the secretion is dis-

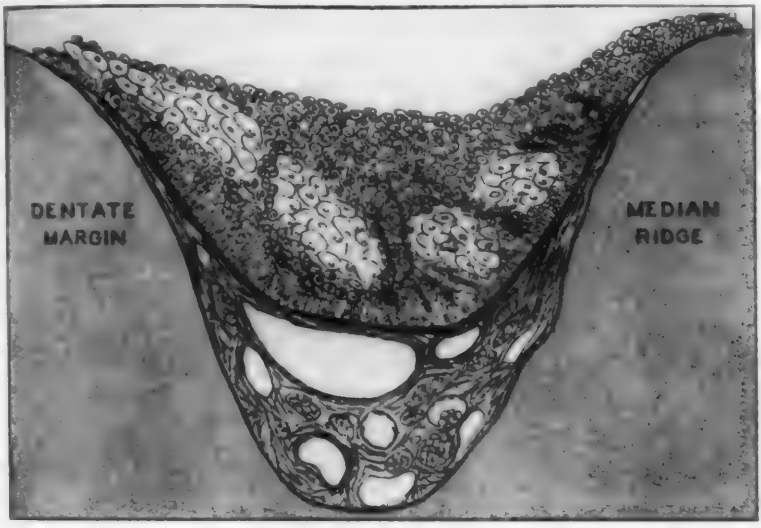

Fig. 9. Enlarged Cross-Section of Lateral Groove and Poison Gland of *T. pastinaca*.

This shows the lateral groove filled with a mass of epithelial cells, some of which are distended with secretion. Surrounding the active cells is a mesh-work of pigment granules. The deeper portion of the groove is filled with alveolar connective tissue separated from the gland proper by a pigmented capillary layer.

After Evans, fig. 1a, 1924a.

charged by means of a canal, of which there are two on either side, a lateral canal near the base of the teeth, and a canal resting on the margin of the median ridge where it looks towards the lateral groove.

It is here that these lateral canals give off the hollow filamentous tubes which project towards each other and are of such length that the two make a bridge across the lateral groove.

The epithelial glandular tissue near the root of the tail is protected by the opposed tail and spine; further out in the mid-region of the spine, it is partially protected by the long secreting filaments (Fig. 11 *s. f.*). Toward the tip of the spine, lateral flaps of tissue

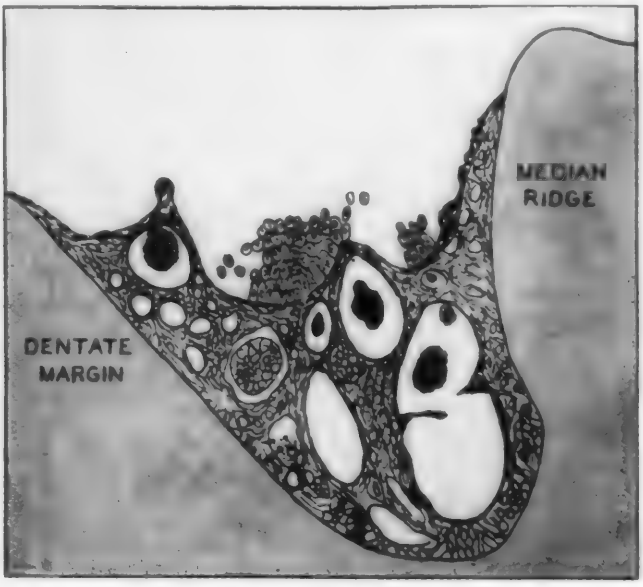

Fig. 10. Enlarged Cross Section of Poison Gland in about Middle of Spine in *T. pastinaca*.

This shows the lateral groove containing alveolar connective tissue and the central and lateral canals. The pigmented capillary layer projects nipple-like above the lateral canal. The true glandular tissue is represented by only a few layers of cylindrical and ovoid cells.

After Evans, fig. 2, 1934a.

grow out and overlie the glandular part. "The flaps [Fig. 12] appear in sections at the distal end, as two pigmented filamentous processes, which start on the inner side from the margin of the median ridge, and on the outer from the root of the teeth; they are developed in connection with the lateral canals."

In a third paper (1924b) Evans gives figures of sections through the distal part of a spine and gland of a sting ray (*Trygon* sp.) from Malaya. These show the lateral processes or flaps described and figured above for the distal part of the gland of Trygon, *i. e.*,

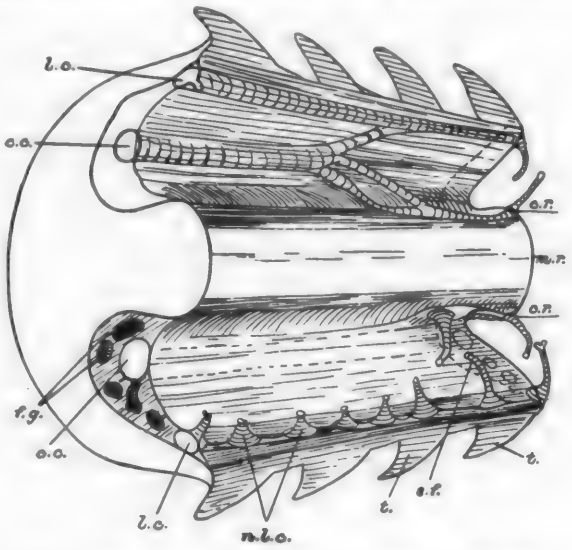

Fig. 11. Diagrammatic Drawing of a Portion of Spine and Glands of *T. pastinaca.*

This is intended to show schematically the arrangement of canals and relations of nipples, filaments and denticles. *c. c.*, central canals; *c. r.*, canal of ridge; *f. g.*, follicles of gland; *l. c.*, lateral canal; *m. r.*, median ridge; *n. l. c.*, nipples of lateral canal; *s. f.*, secreting filaments; *t.*, tooth pointing forward.

After Evans, fig. 7, 1916.

both rays have this structure covering and protecting the glandular tissue out toward the tip of the spine. This effectually settles the question of the normal occurrence of these flaps as protective coverings.

One can heartily agree with Evans' chief conclusion: "That the nature of the wounds produced are not such as would happen after

a simple laceration." But nowhere does our author report any experimental work. It is not to be expected that a doctor working on this subject could readily have a convenient case of sting-ray attack happen in the course of his study, but being at Lowestoft

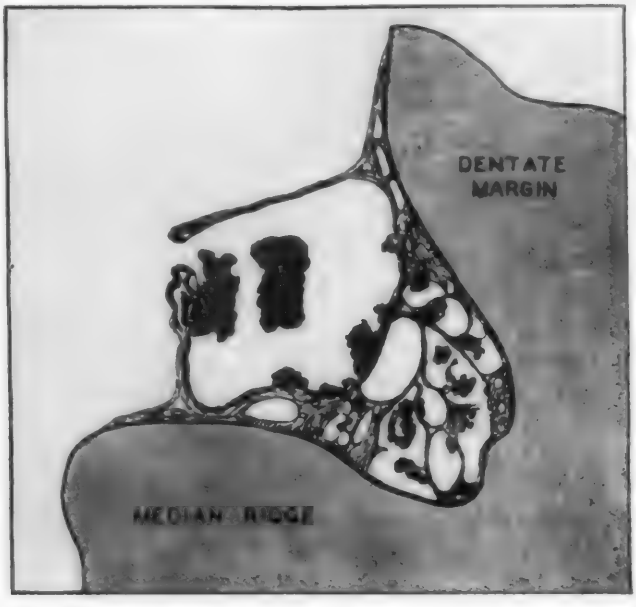

Fig. 12. Transverse Section of Distal Portion of Lateral Groove of *T. pastinaca* to Show the Overlapping Processes Covering the Poison Gland.

In the deep portion of the groove are alveoli enclosing ovoid cells, lateral canals and blood vessels. This region is separated from the true gland by a pigmented capillary layer. The latter is prolonged into two processes which cover over the masses of secreting cells.

After Evans, fig. 3, 1934a.

Hospital on the North Sea, he had fresh-killed rays brought to him, and it seems that he could have pressed out some of the alleged poisonous fluid and have injected it into a dog, rat or guinea pig. If poisoning followed, he would have clinched his case.

This is all the more non-understandable because Evans had as a patient a fisherman whose hand had been pricked and poisoned by the dorsal spine of a dogfish (*Acanthias vulgaris*). He also quoted the account given him by another man of another such sting. Furthermore, he had treated cases of the very virulent sting of the weever (*Trachinus draco*), a fish very common in the North Sea. He made extensive experiments with the poison of this fish, but, as noted, not one with the venom of Trygon, which he surely could easily have gotten. For the details of all these cases, see his 1924a paper.

While Evans made no experiments as to the poisoning nature of the spine and the products of the glandular tissue, he submits that the acute pain, inflammation and paralysis are similar to the symptoms produced by the stings of other venomous fishes with which he experimented.

We now come back to the Potamotrygonid rays and, with a further study of their activities and particularly of the effects of the venom of one of them, this article will be concluded.

Reports of Attacks by Potamotrygonid Rays in Tributaries of the Amazon

Throughout the whole of South America, from the Caribbean to the mouth of the La Plata, fresh-water sting rays are found in all the rivers. For the Guianas two detailed reports of stingings (Schomburgk's and Crevaux') have been given. I have accounts from La Plata waters, but lacking in detail they are of no value here. And strange to say, from the Amazonian system, the "Mediterranean" of South America, with its fifty thousand miles of water ways, where there must have been hundreds of sting-ray attacks, but two accounts have come to hand. These, however, are of much value and will now be given. The second, as we shall see, answers our question.

On the Peruvian Amazon, 1925.—In January of this year, Dr. Harvey Bassler (1942), now of the American Museum, while on one of the headwaters of the Amazon in Peru, witnessed an attack

on one of his men. This victim, wading barefooted on a sandy bottom, was struck in the sole of his right foot by a sting ray.

Fabriciano, in great pain, almost immediately cried out in terror and despair as he staggered to a nearby sandy beach to fling himself upon the sand and, holding his wounded foot in both hands, to writhe in agony, tears trickling down his cheeks, despite his resolution not to make a spectacle of himself. I had been told repeatedly that this was the most excruciatingly painful experience that could befall a man in the Amazon jungle and my unfortunate assistant made this contention very convincing indeed.

The medicine commonly used in Brazil for this and like mishaps is called "Balsamo Divino." This is a colorless oily fluid of several aromatic solutions masked by carbolic acid. Having this at hand, Dr. Bassler used a cotton swab soaked in it to cleanse the wound. Then the swab was bound to the foot over the wound. Whether this balsam is a specific or whether only a small amount of poison was injected, certain it was that after some hours, the pain lessened and presently the wound healed without any inflammation to speak of.

On the Rio Araguaya.—J. Vellard studied two alleged kinds of sting rays found in the river Araguaya, the largest western tributary of the Rio Tocantins, which flows into the Amazon near Para. On this river, in the province of Goyaz, central Brazil, these rays are much feared by the inhabitants. A preliminary report or abstract of his studies was published by Vellard in 1931 and a full account and description of his experiments with the sting or the venom on various vertebrates appeared in 1932.

These rays are very abundant, so much so that in certain narrow stretches of the river, if one goes into the water without being properly shod, he is almost sure to be wounded. The ray found in these water is named *Potamotrygon* (*Taeniura*) *motoro* by Garman (1913, p. 423). It does not differ greatly from *P. histrix*, and it does not seem necessary to figure it. There seem to be two forms, possibly varieties, recognized by the natives, the white ray (*T. dumerilii*) and the fiery ray (*T. mulleri*), but Garman pronounces these names synonyms of *P. motoro*. The former is said to have two large spines about midway of the tail, while the latter has them at the outer extremity. However, the chances are that such tails have suffered mutilation by the bite of some piranha fish. The poison

glands in each ray are found in the normal position previously described for *Trygon pastinaca*. The fiery ray is more feared, because the position of the sting at the end of the (mutilated?) tail makes easier the wounding and because its poison seems more virulent. The rays generally drive the sting into the sole of the foot or lower part of the leg. The force is sometimes so great that the sting is driven through a boot or gaiter.

Vellard records (1932) that while on the Araguaya he had three cases of sting-ray wounds under observation and study. For each case he gives detailed clinical notes. These form the basis for the general statements below. Those wishing the minutiae of these cases are referred to the author's second paper (1932). In addition to these three cases, Vellard states that he had seen numerous "cicatrices, chéloidiennes et retractiles"—vestiges of old wounds inflicted by the rays. Also he saw one man who had lost a finger and another man two toes.

The deep wounds largely lacerate the issues and are very painful independently of the action of the venom. It is only after ten or fifteen minutes that the latter commences to manifest itself. Then begin very strong local cramps progressing to the base of the member wounded and tending to become general. The wounded member shortly becomes immobilized in flexion produced by the severe contractions. The respiration grows rasping and very difficult. The suffering becomes intolerable, and the patient can not avoid giving vent to loud cries. The intense pain persists for ten or twelve hours until it reaches the maximum, but does not entirely cease until several days later.

A little while after the accident the wounded part begins to tumify; swelling, redness and heat come on accompanied by bloody suffusions and by swelling of the glands. Finally there is sloughing, attended with a greater or less loss of tissue, and sometimes with spontaneous amputation of fingers or toes, and even of a foot or hand. Healing is always slow. But, strange to say, deaths from such wounds are rather rare on the Araguaya. When they do come, they are generally preceded by violent tremblings and convulsions; but sometimes death comes during a syncope.

The Question Settled in the Affirmative by Animal Experimentation, 1931–32

Unable to make histological studies of the glands, Vellard did better for he scraped the glandular tissue from the two lateral furrows on the under surfaces of fresh spines. These fresh fragments were ground in sterile distilled water or physiological salt solution. These solutions were not pure, were yellowish in color and contained much mucus, and were acid in reaction and very toxic. They were coagulated by heat and acids and presented all the reactions of albumins. Unfiltered solutions were more active than filtered ones. Dessication greatly decreased the activity of the poison.

And now Vellard did what no one had ever done before—he experimented on living animals. Most of his experiments were done with the venom of the fiery ray, both dried and fresh. For the carefully noted details of his experiments, see his 1932 paper.

A toad of 25 g., pricked with a fresh sting on the back, died in 125 minutes; another of 20 g., pricked with the same sting, died after 48 hours. A tree frog of 70 g. was pricked with the same sting in the same place. At the end of 48 hours the edema had disappeared and there was no necrosis. Evidently the major portion of the venom was used up in the first experiment, and most of the remainder in the second.

The symptoms in mammals were similar to those observed on batrachians. A mouse of 30 g. was pricked in the back with a fresh sting. It died in 70 minutes. A dog of 800 kg. had the muscles of its left leg pricked deeply with a fresh spine and the spine left in the wound for 2 minutes. The animal became very sick with essentially the same symptoms that were noted in the men, but presently recovered.

Subcutaneous and intramuscular injections were made of a solution of fresh venom. This was made of fresh sting material minced in freshly boiled water. A toad of 30 g. injected with 1 c. c. in the thigh died in fourteen minutes. A little frog of 7 g. injected with 0.3 c. c. in the dorsal lymph vessel died in three minutes. A lizard 20 c. m. long received 0.5 c. c. under the skin of the back and died in 41 minutes.

Vellard did controls, using dried spines. From dried spines softened in physiological salt solution, the gland was scraped off, triturated and emulsified in liquid and filtered. This material was injected into veins, into muscles, into the skin, and into the cerebral ventricle of rabbits and dogs. In all cases the results were much inferior to those obtained with the use of fresh spines. So also dried venom applied to scarified skin produced but little reaction. Hence he concludes that Indian arrows headed with dried spines would be painful but probably not poisonous.

Dried venom, either on dried spines, or made into solutions, was tried on four dogs, a guinea pig and a rabbit, and on one pigeon. But in all cases the results were much below those obtained with fresh stings, though the symptoms were all somewhat comparable. All the animals of all these experiments recovered.

In summation, Vellard declares that of the vertebrates subjected to experiments—batrachians, lizards and mammals—all are sensitive to the action of the fresh venom. In every case the development of the symptoms (*douleur, crampes*, etc.) was more rapid at the place of injection of a solution of the venom than after pricking with a spine. Thus one can appreciate the relative slowness of absorption of the venom from the mucus-covered spine. But local symptoms, by reason of the dilution of the venom, are much less pronounced with the solutions.

In short, Vellard made personal studies of three patients stung by rays. and made numerous experiments on frogs, lizards and dogs, using fresh spines for pricking, and dried spines, dried venom, and fresh and dried venom in solutions, and his experiments definitely establish the fact that—*the sting ray's sting is poisonous.*

Treatment of Wounds Made by Sting Rays

Most remedies are purely and frankly empirical—hit or miss, more likely the latter. Thus Rondelet, a doctor of 1554, applied the split liver of the ray to the wound, or, having calcined the sting, applied the ashes as such, or dissolved in vinegar, to the wound. Often the wound was washed with wine or plain vinegar. In South America, Schomburgk (1842) had the wounds of his men sucked; he ligatured the limb, used a wash of laudanum, and applied warm

poultices of cassava bread. The men finally recovered. And in the same Guiana country in 1881, the wounded companion of Dr. Crevaux had his wound sucked and then cauterized with carbolic acid and also bathed with tobacco juice. The patient had some relief, but after suffering for 48 hours, died.

Mr. R. J. Coles, while fishing off Cape Lookout, N. C., was stung by an eagle ray. In dreadful agony, not knowing what else to do, he opened the wound at once and injected a very strong solution of formaldehyde. One would think that the pain from the remedy would have been almost as bad as that from sting and poison, but he recovered and told me the story a year or two later. The remedy was applied quickly following the stinging, and, since ten or fifteen minutes are generally required for the poison mixed with mucus to diffuse thoroughly into the wounded member, it may be that the strong formaldehyde broke up or neutralized the poison before much of it had got to work.

Evans has worked with various poisonous fishes other than Trygon—especially with the "weever," *Trachinus draco*. For all fish poisons, he suggests hypodermic injections of 2 to 5 per cent of permanganate of potash or a 1 per cent solution of gold chloride in the close vicinity of the wound.

Vellard states that along the Araguaya River, the inhabitants use hot washes in the wound—oil or alcohol. These often cause bad burns and help the necrotic venom to keep the patients immobilized for several months. Oftentimes mud poultices and dressings of petroleum and tobacco juice are applied. The ulcers resulting from wound and medicaments are treated with decoctions of various plants. Almost always they become infected with bacteria or spirilla. On the Amazon the "Balsamo Divino" is used, the potent agent probably being the carbolic acid.

Manifestly what is needed is a specific serum, antitoxic and antinecrotic. This being virtually unobtainable, Vellard recommends treatment to allay the pain and to retard the absorption of the poison, and to combat the general symptoms of the intoxication. He suggests the use of morphine and of heart tonics. Fortunately, thanks to the mucus on the spine which coats over the torn tissues, the toxin from the fresh spine requires sometimes as much as fifteen minutes before

the first symptoms of poisoning appear. Something then is needed to bathe the wound and to coagulate and destroy the venom—alcohol, tincture of iodine, or potassium permanganate. Such treatment is most helpful in destroying *in loco* the poison before it is absorbed into the system.

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A SALERNITAN STUDENT'S SURGICAL NOTEBOOK

HENRY E. SIGERIST

The text that I am publishing here comes from the 12th century manuscript of the Municipal Library of Vendôme in France.[1] The manuscript is of Italian origin, and in the second half of the 15th century it belonged to Theodore Guaineri, physician-in-ordinary to Charles VIII and Louis XII. His and his father Antonio's collection of books became the property of the Abbaye de la Trinité in Vendôme.

The manuscript contains seven medical treatises, texts that were popular in the School of Salerno such as the *Liber urinarum* and the *Liber febrium* of Isaac Judaeus in the translations of Constantinus Africanus, the pseudo-Hippocratic *Epistula de phlebotomia* in its later version, a comprehensive *Antidotarium*, etc.

Our text, unlike the others, has no title. It stands on fol. 16v-18r between *Hermeneumata* and the *Liber urinarum* of Isaac Judaeus. The text can be divided into two parts, the first of which contains prescriptions for the treatment of wounds, skin diseases and similar affections, while the second part consists of instructions for the treatment of fractures, dislocations, the extraction of teeth and other surgical procedures. The language is a vulgar Latin. Wound is always called *plaga* never *vulnus*, leg is *gamba*, head sometimes *testa* etc.

The text is not systematic in any way, but appears rather as a fragment. My first endeavor obviously was to trace its sources. There is very little mediaeval surgical literature in Latin before the 12th century, and even in the 12th century it is not too rich so that the search for sources was relatively easy. Since the choice of drugs and recipes shows that the text is decidedly post-Constantinian, the first treatise to be consulted was Book IX of the Pantegni, Constantine of Africa's version of the *Liber regalis* of Ali ibn el-Abbas.[2]

[1] See Henry E. Sigerist, Early Mediaeval Medical Texts in Manuscripts of Vendôme, *Bulletin of the History of Medicine*, 1943, vol. 14, p. 91 ff.

[2] We are much handicapped in our work by not possessing a copy of the *Opera Isaac*, Lyon, 1515. I am therefore greatly indebted to Dr. Harry Friedenwald for having lent me his copy.

But our text does not occur either in the edition of 1515 or in the version published by J. Pagel.[3] Nor can it be found in the 12th century surgical writings of the School of Salerno such as the so-called Bamberg Surgery, the Surgery of Roger Frugardi or the glosses to Roger.[4] Vocabulary and material are very similar, but it was impossible to trace any identical passages. The conclusion therefore must be that we are dealing with an unknown original surgical text of the 12th century and our task now is to determine its character.

A closer examination particularly of part II soon reveals the didactic nature of the text, and I think we can safely assume that it is nothing else but a student's notebook with recipes and instructions written down during a course in surgery.

In prescription 6 the professor dictated the recipe of a potion for the treatment of wounds and then went on to explain the action of the individual drugs, a typical school procedure. The instructions in part II sometimes discuss minute details that would be obvious to a mature surgeon. Thus in 12 the recipe for *unguentum fuscum* includes lard, and the student is instructed that lard must be purified first and how this is done. *Unguentum fuscum* was one of the most popular wound ointments, and its recipe is given in the *Antidotarium Nicolai* and in all Salernitan surgical books. But nowhere do we find the instruction about the purification of lard. It was obvious to surgeons but not to students. In 17 the needle for sewing a wound is described in great detail. It must be of steel (*de chalybe*), very thin and long, square at the end with a very narrow eye.

The language of the text is decidedly a spoken language, and it seems likely that some of the instructions at least were written from dictation (*hoc dico* in 14). This would explain misunderstandings (*aqua*: *olla* in 12) or the fact that a few sentences are so muddled up that they do not make sense (e. g. in 12 and 14) or that sentences are incomplete, the verb having been dropped (e. g. in 14).

[3] Eine bisher unveröffentlichte lateinische Version der Chirurgie der Pantegni nach einer Handschrift der Königl. Bibliothek zu Berlin, *Archiv für klinische Chirurgie*, 1906, vol. 81, part I, pp. 735-786.

[4] See Karl Sudhoff, *Beiträge zur Geschichte der Chirurgie im Mittelalter*, vol. II, Leipzig, 1918.—George W. Corner, On Early Salernitan Surgery and Especially the "Bamberg Surgery," *Bulletin of the Institute of the History of Medicine*, 1937, vol. V, p. 1 ff.

I think that there are four major arguments for attributing this notebook to a student of the School of Salerno:

1. Where could a student study practical surgery in the 12th century in Latin if not in Salerno? This is not a theoretical monastic text but an eminently practical one. Outside of Salerno the surgeons were still uneducated craftsmen, while in Salerno instruction including surgical instruction was given in Latin.

2. Many of the composite remedies were taken for granted (e. g. *unguentum populeon, agrippa, marciaton, dialtea* etc.). It was sufficient to name them, and there was no need for giving the recipes because they could all be found in the *Antidotarium Nicolai* which was the more or less official pharmacopoeia of Salerno.

3. The surgical views and procedures described are very similar to those of the Salernitan surgical books, although the wording is never identical.

4. All texts of the Vendôme manuscript 174 have some connection with Salerno.

I have not translated the recipes of the first part with one exception, because they are very simple, and I have limited myself to giving a brief commentary. I found it advisable, however, to translate the second part because it presents a few difficulties that require interpretation.

The tradition of the text is good as a whole so that it can be published without changes. I have added only the numbers and some punctuation. The text follows:

I.

[16v] 1. UNGUENTUM AD MALUM GAMBE ET AD OMNES PLAGAS.

Recipit hec: ceruse ℈ IIII, lithargiri ℈ S. Fac pulverem, distempera cum oleo et aceto.

Malum gambe is probably the varicose ulcer. The acetate, carbonate (cerussa), and monoxide (lithargyrus) of lead have been widely used in the treatment of wounds until our day for their astringent and dessicating action.

2. Pulvis ad idem.

Aloe, pice greca. Fac pulverem, in plagam inpone.

Aloes was originally imported from Arabia and India. It was used not only as a cathartic but also as an astringent in the treatment of wounds. See Galen (Kühn) XI, 821 f. *Pix graeca* is colophony or rosin, the distillate of turpentine. It is slightly antiseptic and was frequently used in the treatment of wounds. See Zedler, *Universal Lexicon*, vol. V.

3. Unguentum ad scabiem

Recipe nitrum conbustum ·1·, sulfuris vivi 31, aceto colligantur, et in vase eneo uteris.

4. Ad idem.

Recipe cimolea creta alba ℈ II, alcionia ℈ 1, aceto collige et balneo uteris.

Scabies was a generic term that included what we call scabies but probably other skin diseases as well. Sulphur and natron were frequently used in the treatment of various skin diseases.

The second recipe consists of a mixture of white Cimolian chalk (see Pliny 35, 17, 195) and *alcyonium* or sea-foam, that smelled of foul fish. Pliny describes it in detail (32, 9, 86) and Galen discusses its virtues (XII, 370). Both chalk and alcyonium were used in dermatology and cosmetics.

5. Ad eos quibus manus et facies crepant.

Recipe costi, cere, masticis, olei veteris. Confice et uteris, quoniam res est optima, et miraberis eius effectum.

This is decidedly a cosmetic prescription for chapped hands and faces, but we must remember that the mediaeval surgeon was the "beautician" of the day.

Besides wax, mastic and oil the recipe contains costus, the aromatic root of a plant (Costus arabicus L.) which used to be imported from India via Arabia or Syria. In the Middle Ages and Renaissance various substitutes were sold under the same name. See Matthiolus I, 15.

6. Potio ad plagas sanandas.

℞. betonice, salvie, piloselle, edere terranee, agrimonie, lanciole, viole, melagine, spargule, equale pondus pista, et in vino posite colate, detur infirmo secundum posse potui die, et etiam in nocte detur.

Nunc virtus omnium herbarum dicitur. Melago [1] ponitur pro plaga tenenda aperta. Betonica pro febre. Agrimonia [2] stringit. Lanciola [3] id est bataliola facit stagnare sanguinem. Edera refrigerationem prestat. Viola tollit dolorem. Pilosella [4] stringit. Salvia effugit paralisin et alias guttas, que membra debilitant. Vrisula [5] stringit sanguinem.

This prescription more than any other reveals the didactic character of the text. Indeed it is unusual to find in the recipe for a compound remedy an explanation of the action of the individual drugs, while it is logical for a teacher to give such explanations when recommending a remedy to his students:

"Melago [1] is applied to keep the wound open. Bettony for the fever. Agrimony [2] constricts. Lanciola [3] that is bataliola makes the blood coagulate. Ivy cools. Violet removes the pain. Pilosella [4] constricts. Sage drives off palsy and other fluxes that weaken the limbs. Vrisula [5] constricts the blood."

1. I do not know what plant *melago* is. 2. According to Galen XIII, 664 agrimony dried out wounds. 3. About *lanceola* see Galen XII, 63. I have never seen the synonym *bataliola*. 4. See Matthiolus IV, 10. 5. *Vrisula* and *spargula* seem to be the same drug. Spargula occurs in the Bamberg Surgery (Sudhoff, l. c. 114) and in the Antidotarium Nicolai as constituent of *unguentum marciaton*. I have not been able to find vrisula.

7. Tractum ad easdem plagas

quod conficitur ex suco absinthii et oleo et melle et farina de sigale.

Tractus or *tractum* was a cataplasm that contained some kind of flour, see e. g. Sudhoff, l. c. p. 254. *Sigale* is secale, rye or black spelt.

8. Purgatio ad idem ne faciat putredinem.

Vinum, oleum, sal; distempera et infunde pannum et pone super.

This was a wet dressing, a cloth being dipped in a mixture of wine, oil, and salt whereupon it was applied to the wound.

9. Unguentum ad omnem ignem acrum.

Jusquiamini cum axuncia vetere pisa fortiter et pone ubi plaga fuerit, et pisa carbones caloperones (?) similiter.

About jusquiaminum (hyosciaminum) sc. oleum see Matthiolus I, 36. It was used externally for all kinds of inflammatory processes, here for erysipelas or ignis ⟨s⟩acer. About the use of ground coal see Sudhoff, l. c., p. 347. The

reading of *caloperones* is not certain; it may be a vulgar form for *calabricos*, a possibility to which Dr. George W. Corner drew my attention.

10. Unguentum ad fistulas.

Recipe piper, saponem, spatarantem, calcem vivam, capitellum, cinerem fabe, tartarum, vitriolum, nitrum antiquum, quantum sufficit tunde et cum aliis speciebus conpone, et mitte ibi mel quantum tibi videtur et coque diligenter ad lenem ignem ut sit unguentum.

With pepper, soap, quicklime, lye (*capitellum*), burned beans, tartar, vitriol, and natron this was an irritant remedy such as was used in the treatment of fistulas. *Spatarantem* may be a corruption for *sandaracam* since sandarac was used in the treatment of fistulas (See Sudhoff, l. c., p. 261).

11. Pillule g⟨alieni⟩.

Ad flegma deponendum et gravem fumum capitis ascendentem, oculos purgat et stomachum. ℔ aloes, diagridii, coloquintide, absinthii, masticis, ana ʒIII; tempera cum suco solatri vel scariole, fac in modum ciceris, dabis VII, sive VIIII.

This Galenic recipe (Galen XIV, 327) was a strong purgative containing aloes, the juice of scammony (*diagridium*), coloquinths and wormwood. Galen gave the pills with cider (*ἀναλάμβανε χυλῷ μήλων*), while here the drugs are tempered with the juice of solatrum or scariola. *Solatrum* is the strychnos or solanum hortense of Dioscorides (See Matthiolus IV, 66 and particularly Gerard II, 55: "it is called of the Graecians *στρύχνος*, of the Latines Solanum, and Solanum Hortense, in shops Solatrum"). *Scariola* according to Matthiolus II, 125 was the same as intubus or endive (scarole or escarole in French).

II.

12. Racio medendi ossa fracta hec est:

Primum previde et lenissimis manibus apta ad proprium locum male incisas fracturas. Quo facto in sartaginem mel et acetum pone et diutissime fervere dimitte, quod ut pati poterit calidum superpone cum stuppa aut bombicino[1]; deinde lignula plana recta ad invicem rectibus (?) cum catena circumliga; hoc per triduum fieri [17r] necesse est. Post tercium vero diem his reiectis aqua calida diu fomenta et facta fomentatione agrippam superlinies aut alteam aut marciaton,[2] et bombicino et stuppa circumvolve. Hoc ungere et

circumvolvere et circumligare et fomentare contemplata etate bene mane et vespere unaquaque die usque ad XX dies fieri oportet. De pueris enim sentitur quia eorum ossa usque ad XIIII dies solidantur habita tamen cura. Iuvenum vero usque ad XIIII dies solidantur. Senium autem usque ad XX vel XXII vel XXIII. Puerorum itaque expectatio usque ad XIII vel XIIII dies, senium usque ⟨ad XX⟩ vel plus. In his igitur diebus iuxta predictam rationem constrictorium ita facies: sume olibanum,[3] masticem, bolum arminicum, cera⟨m⟩ equali pondere; ceram solve et horum pulverem bene tricoscinatum supersparge et ad modum ceroti coque et tepidum superpone, et aqua tepida vel aliquo tali optime lavetur, et sic cerotum superpone. Non enim adheret cerotum propter unguentum. Oportet autem te scire quod si ulcus affuit non debes apponere in ulcere preter unguentum fuscum [4] et circumlinire alia loca dolentia vel tumida ex supradictis unguentis.

Unguentum autem fuscum.

℞ hec: colofonie ℈ III, masticis ℈ II, cere III, olei libras III, sevi porcini libram I; quod priusquam in coctura ponatur, solutum prout mundare potueris; ut aliquantulum supra ignem in aliquo vase colatum prout mundus poteris in aqua frigida superspargat et sic etiam datum adiungatur.[5]

Confice autem sic: in aqua [6] oleum ponatur et sic igni adiungatur, lento tamen. Deinde sevum appone. Cumque liquefactum fuerit, ceram mitte. Et liquefacta ceterum pulverem appone, sub intervallo tamen, et tamdiu dimitte super ignem bullire quousque tibi coctum videatur. Quo facto conde et usui reserva.

THE METHOD OF CURING BROKEN BONES IS THE FOLLOWING:

First look and adjust with the hands very gently the badly broken bone-ends to their proper place. Thereupon put honey and vinegar into a pan and let it boil for a long time. Apply it as hot as the patient can stand it with a linen or cotton cloth.[1] Then with a chain fasten around it small flat straight boards on both sides. This must be done for three days. After the third day remove all this and foment with hot water for a long time. And after having fomented it, smear over it agrippa or altea or marciaton ointment [2] and wrap it up with a cotton or linen cloth. This anointing, wrapping, binding and fomenting must be done daily for twenty days in the morning and evening after having well considered the age of the patient. We under-

stand that the bones of children consolidate in 14 days when there has been treatment. Those of young people consolidate in 14 days; those of old people however need 20 or 22 or 23 days. The expectation of children is therefore of 13 or 14 days, of old people of 20 days or more. During those days, besides applying the aforesaid method of treatment you will make an astringent remedy thus: take frankincense,[3] mastic, Armenian bolus, wax equal weights; melt the wax and sprinkle the well sifted powder of those over it and cook it in the manner of a wax plaster and apply it lukewarm. The patient shall be well washed with lukewarm water or something similar and the wax plaster is then applied. The plaster will not stick on account of the ointment. You must know, however, that if there is an ulcer you must not apply anything to it except the dark ointment [4] and that you must smear the other sore or swollen places all around with the above mentioned ointments.

DARK OINTMENT

Take this: colophony 3 ounces, mastic 2 ounces, wax, oil 3 pounds, lard 1 pound. The latter must first be put to cooking so that you may purify it when it is melted. Hold it over the fire for a little while in any kind of vessel, strain it and when it is pure it swims on top of cold water and may then be used.[5]

Make [the ointment] thus: the oil is put into water [6] and is then put on the fire, but on a slow fire. Then put in the lard. When it has melted put in the wax. And when the wax has melted bring in the rest, the powder, after a while however. And let it boil on the fire until it appears to be cooked. Then put it away and store it for use.

1. *Bombicinum* sc. *pannum* may be either a cotton or silk cloth, but here the word was undoubtedly meant to designate cotton. Silk was usually called *sericum* at that time, see 17: *cum sirico filo*. See also Sudhoff, l. c., p. 638. 2. The recipes for all these ointments are in the *Antidotarium Nicolai*. 3. *Olibanum* is the Greek libanos. Gerard III, 86 says: "but in shops it is called Olibanum, of the Greek name and article put before it." 4. *Unguentum fuscum* was one of the most frequently used wound ointments. It occurs in the *Antidotarium Nicolai* and in all Salernitan surgical texts. 5. The passage is not clear and gives the impression that it had been dictated. The translation is only an approximate one. 6. The *Antidotarium Nicolai* has: oleum in *olla* super ignem mittatur, which gives a better sense. If the text was dictated *aqua* may well be a misunderstanding unless the ointment was to be prepared in a double boiler.

13. DENTES AUTEM ABSTRAUNTUR HOC MODO:

Contemplare utrum abstrahen⟨dus⟩ sit lacior in superioribus aut angustior, et quasi aliorum latitudine conprimatur. Quod si visum tibi fuerit videlicet aliorum mole comprimi, tenatibus abstrai ferreis.

Hoc tamen iubet [1] ut radices eorum prius scapello circumfodias in utroque, deinde eo abstracto aceto cum sale gargarizare.

TEETH ARE EXTRACTED THUS:

Consider whether the tooth that is to be pulled, is rather widely set among the upper teeth or rather narrowly and is compressed as it were by the bulk of the others. If this seems to be so, namely, that it is compressed by the mass of the others, extract it with an iron forceps. He prescribes, however,[1] that you dig around their roots first with a knife on both sides. Then after it has been extracted, gargle with vinegar and salt.

1. *Hoc tamen iubet* may be understood in two ways, either: This (namely the extraction of the tooth), however, demands that you etc., or: He (the teacher), however, prescribes this, namely that you etc. The latter interpretation seems more probable and would be one more evidence for the didactic character of the text.

14. AD PLAGAM CAPITIS SI SIT,

diligenter inquire utrum longa sit an non, etiam an os fractum fuerit. His autem previsis si profunda et testa rupta fuerit primitus capillos tonde, induc pannum licinium absque ullo medicamine vel lardi frustrum excoriatum iuxta plage quantitatem incisum in ipso ossis habitu ne sanies irruens miningas sua putredine ⟨corrumpat⟩. In primis erit sanguis stringendus pulvere damasceni.[1] ℞ aloe, turis corticis ÷ II, sanguinis draconis, sarcocolle ana 3XXII, ramorum eruce 3VIII; tempera cum albumine ovi et pilos pone leporis. †Extendatae aliquid morbus† [2] ignem pone [3] et post primum [4] pone imbrocam que sic fit: vinum et oleum, et pannum, non tamen ex toto assum fac fervere in sartagine aut aliquo vase, postea si superfluum merum inesse tibi visum fuerit cola tamen [17v] quanta superfluitas est; deinde hec imbroca imponatur usque ad tercium diem. Postea unguentum fuscum unaquaque die imponatur in plagella. Memento tamen ut predictum licinium semper sit, donec caro supercrescat. Quod si os ruptum non fuerit sue cum acu in duobus locis vel tribus. Hoc dico si plaga magna fuerit. Deinde tonsis capillis embrocam predictam usque ad predictum terminum, et postea unguentum fuscum in plagella pone.

FOR A WOUND OF THE HEAD IF THERE IS ONE

Inquire diligently whether it is large or not, also whether the bone has been broken. After you have ascertained this, if the wound is deep and the

skull broken, first shave the hair, introduce a lint cloth without any medicament or a piece of lard with the rind removed, cut according to the size of the wound in the very shape of the bone, so that the sanies will not break into the meninges ⟨and corrupt them⟩ with its foulness. First the blood must be stopped with Damascene powder:[1] Take aloes, bark of frankincense 2 ounces, dragon's blood, sarcocolla ana 22 drachms, twigs of rocket 8 drachms, temperate with egg white and put in rabbits' hair . . .†[2] apply fire[3] and after the first[4] apply a poultice which is made thus: let boil in a pan or any other vessel wine and oil and a cloth but without cooking it altogether. Then if there appears to be superfluous wine strain whatever superfluity there is, whereupon this poultice shall be applied until the third day. Then dark ointment is applied every day to the wound. Remember however that the aforesaid lint must be kept in all the time until the granulations grow over it. If the bone has not been broken, sew with a needle in two or three spots; I mean if the wound is large. Then after the hair has been shaved apply to the wound the aforesaid poultice for the prescribed period and then dark ointment.

1. One of Sudhoff's texts (l. c., p. 189) has a similar recipe. 2. The passage must be corrupt. 3. *Ignem pone* probably means: cauterize. 4. *Post primum* means probably *post primum diem*, after the first day, rather than post primum ignem, after the first cauterization.

15. AD PLAGAM PROFUNDAM FACTAM DE LANCEA IN QUALIBET CORPORIS PARTE EXCEPTO IN CAPITE.

Primum pone lardum tantum quantum longa et lata esse videtur plaga, unguento fusco unge, tunc pultem hoc modo compositam pone: vinum, farinam, oleum commune, mel, ceram, salvia, absinthium, tritacum, axungia porcina, omnia equali pondere, pone in sartaginem facque fervere. Quo facto cum panno superpone, semper eque quantitatis usque ad VII dies. Deinde in unaquaque die, prout caro solidaverit, paulatim lardum diminue, quousque iam plaga clausa tibi videatur, et tunc impone emplastrum aliquod vel unguentum fuscum in abluta. In capite autem non oportet hanc ponere pultem, sed embrocam predictam quia non est conveniens ubi pili nascuntur propter constrictionem pororum.

15. FOR A DEEP WOUND MADE BY A LANCE IN ANY PART OF THE BODY EXCEPT THE HEAD.

First apply lard as much as the wound seems long and wide; anoint with dark ointment, then apply a pap made thus: wine, flour, ordinary oil, honey, wax, sage, wormwood, wheat, pork fat, all in equal measure; put it into a pan and let it boil. Then apply it on top with a cloth always the same amount

for 7 days. Then day by day as the flesh consolidates gradually reduce the amount of lard until the wound appears closed. And then apply any plaster or dark ointment to the wound after it has been washed. This pap, however, must not be applied to the head but the poultice mentioned before, because it is not advisable where hair grows because it constricts the pores.

16. Quod si aliquo casu cadenti disiuncta fuerit sum<m>a vi ex utraque parte trahatur manibus ut ad pristinum locum redeat iunctura. Quo facto planta utrarumque manuum locus stringatur, postea locus fomentetur aqua calida, deinde circumliniatur agrippa, et tabule superponantur. Huius autem fiat mutacio in tercium diem cum fomentatione semper et postscriptum strictorium superpone. Si autem radunculus in aliquo loco natus fuerit, primum circumunge unguento populeo;[1] quod si visum tibi fuerit latere aliquam saniem, inquire ubi ad superficiem propinquior sanies fuerit, ibique punge scalpello, et inice licinium unguento fusco unctum quousque sanetur.

16. If somebody falls and suffers a dislocated joint, you must pull with the hands with great strength on both sides so that it returns to its previous position. Then the place must be pressed tightly with the palms of both hands. Thereupon the place is fomented with hot water and is then anointed with Agrippa and pads are applied on it. This is changed the third day while it is always fomented, and apply the astringent mentioned below. Should a phlegmon have developed somewhere, first apply populeon ointment[1] all around. If it seems to you that it conceals pus, find out where the pus comes closest to the surface and there puncture with the knife and put in a lint soaked with dark ointment until it is healed.

1. The prescription of unguentum populeon is in the *Antidotarium Nicolai.*

17. Si autem alicui abstrahatur oculus

frangatur ovum et eiciantur exteriora et ea maxime agitentur cum ligniculo. Deinde ea imposita abluta caverna oculi apponantur usque ad tertium diem ut tumor[1] resideat et dolor tollatur. Si plaga appareat aliqua, unguentum fuscum appone donec sanetur cum licinio vel abluta prout plaga profunda fuerit aut in superficie posita fuerit. Sed si auricule vel gene vel labia vel nasus alicui incidatur aliquo casu, prius suatur in duobus locis vel tribus vel pluribus cum sirico filo, prout quantitas plage fuerit. Sit autem acus de calibe, subtilissima et longa, in summo quadrata, strictissimum foramen habens. Deinde embroca de panno non ex toto usto superponatur usque ad

III diem. Deinde ex his pulvis superspargatur unaquaque die mane: ℞ olibani, masticis, cinnami, colofonie, boli armenici. Vespere autem unguentum fuscum ponatur.

17. If Somebody's eye is knocked out

an egg shall be broken and the egg-white shall be poured out and shall be beaten as strongly as possible with a wooden rod. Then let it stand and after the cavity of the eye has been washed the egg-white shall be applied for three days so that the swelling [1] subside and the pain be removed. If there is a wound apply dark ointment until it is healed. Apply the ointment with lint or after the wound has been washed, according to whether it is deep or superficial. If, however, somebody's ears, or cheeks, or lips or nose have been cut by accident, stitch the wound first in two or three or more places with a silk thread according to the size of the wound. The needle must be of steel, very thin and long, square at the end with a very narrow eye. Then a poultice with not entirely scorched cloth is applied on top for 3 days. Then every day in the morning a powder made from the following is sprinkled over the wound: take frankincense, mastic, cinnamon, colophony, Armenian bolus. In the evening, however, dark ointment is put on.

1. The text has *timor*.

18. Si autem aliqua costarum alicuius hominis forte percussa fuerit et introrsum plicata fuerit costa, hoc modo reduces ad exteriora: fac construi longum ignem ad longitudinem hominis et nudus calefiat ventrem et costas. Tunc vero habens mel coctum ungue manus utrasque ex eo melle, et paulatim plantis perunctisque manibus tange dolentem locum et trahe suaviter, sic sepe facies semper trahendo, ⟨usque⟩ equalis sit aliis costis. Denique marciaton et ceteris unguentis foveatur et emplastrum apostolicum vel aliud quodlibet [18r] donec sanetur exterius ponatur.[1]

18. If one of the ribs of some individual has perhaps been struck and the rib has been bent inwards, you shall bring it back to the outside in the following way: have a high fire made, as high as the individual is long, and he shall warm his belly and ribs nude. Then have honey cooked and anoint both hands with this honey. And gradually touch the sore spot with the palms and with the anointed hands and pull gently. You shall do so often, always pulling until it is like the other ribs. Finally it shall be fomented with marciaton and the other ointments and apostolicon or some other plaster shall be applied outside until it is healed.[1]

1. Compare this instruction with that of the Bamberg Surgery, Sudhoff, l. c., p. 134.

CENTENNIAL OF THE *ANNALES MÉDICO-PSYCHOLOGIQUES*

RAYMOND DE SAUSSURE

In 1843, nine years before the founding of the Medico-Psychological Society of Paris on April 26, 1852, appeared the first issue of a new journal, the *Annales Médico-psychologiques*. The publication of this journal was undertaken by three men, Baillarger, Cerise and Longet; its pages have set forth the opinions of all the leading figures of French psychiatry for the last one hundred years.

Jules-Gabriel François Baillarger was born on March 25, 1809, at Montbazon of a well-to-do agricultural family. A student of Trousseau, Cloquet, and Esquirol, his first work was on the anatomy of the brain. At the age of thirty-three he published his famous treatise " De l'influence du passage de la veille au sommeil et du sommeil à la veille sur la production et la marche des hallucinations." [1] A year later he was to found the *Annales Médico-psychologiques*. His labours were truly Herculean; no aspect in the whole field of psychiatry escaped his attention. His studies on hallucination, on the heredity of mental illness, and on cretins are standard works today. At the age of eighty, Baillarger revised his entire life work and published his *Recherches sur les maladies mentales*.[2] He died the following year, December 31, 1890.

Of Italian descent, Cerise was born at Aosta in the Piedmont, in 1807. At twenty-one he graduated from the School of Medicine at the University of Turin, and six years later was authorized to practice in France, where he became extremely active. As early as 1836, he published his *Exposé et examen critique du système phrénologique*, and in 1842 his book entitled *Des fonctions et des maladies nerveuses considérées dans leur rapports avec l'éducation sociale et privée, morale et physique*, a remarkable work for which he was given a prize by the Académie de Médecine. The very year that he was collaborating on the first issue of the *Annales*, he at the same time wrote another work *Essai sur les principes et les limites de la science des rapports du physique et du moral, etc.* Nor must we forget our

[1] *Bulletin de l'Académie de Médecine*, Vol. VII, 1842, pp. 758 f.
[2] Masson, Paris, 2 vols., 1890.

indebtedness to him for a new edition of the standard works of Cabanis.

François Achille Longet, the youngest of the three colleagues, was born in 1811 at Saint Germain en Laye, and received his medical degree from the University of Paris in 1835. His career was meteoric; by 1843, while still only thirty-two years old, he was Surgeon of the Première Succursale de la Maison Royale, as well as Professor of Anatomy and Experimental Physiology. In addition to a number of treatises on various aspects of physiology, he had just published in the preceding year his *Anatomie et physiologie du système nerveux de l'homme et des animaux vertébrés.*[8]

It was a particularly favorable moment for the launching of a psychiatric periodical; around Pinel and Esquirol there were gathered a brilliant cluster of star pupils: Fodéré, Royer-Collard, Dubuisson, Marc, Broussais, Amard, Ferrus, Brachet, Falret, Felix Voisin, Scipion Pinel, Etienne Georget, Trelat, Leuret, Calmeil, Brierre de Boismont, Bayle, Foville, Lélut, and Moreau de Tours, to name only the most famous. The five preceding years had witnessed the appearance of a large number of important works on mental disease. In 1838, *Des maladies mentales* by Esquirol; in 1840: *De la folie, considérée dans ses rapports avec les questions médico-judiciaires* by Marc, *Du traitement moral de la folie* by Leuret, *La médecine des passions* by Descuret, and Moreau de Tours' *Etudes physiques sur la folie* and finally, two works in 1843: *Considérations générales sur les maladies mentales* by Jean-Pierre Falret, and *De l'idiotie chez les enfants* by Felix Voisin.

The *Annales Médico-psychologiques* bore the sub-title: "Journal of the Anatomy, Physiology and Pathology of the Nervous System, devoted particularly to the collection of all documents pertaining to the Science called 'The Relation betweeen Body and Mind,' to Mental Pathology, to the Medico-Legal Aspect of the Insane, and to the Clinical Treatment of the Neuroses." In their Introduction, the Editors declare: "Mental pathology is closely allied to moral and intellectual physiology, itself in turn closely allied to the anatomy, physiology and pathology of the nervous system. It seems to us that the moment has now arrived when these various elements

[8] Paris, two volumes in 8vo, with plates.

of the Science of Man must be brought closer together and coordinated for their mutual corroboration."

To try to give, within the brief space allotted us, even a bird's eye view of the achievements of the *Annales*, in its one hundred years' existence, would be to retrace the entire history of psychiatry from the time of Esquirol to the present. We must, therefore, remain content with an analysis of Volume I.

The volume opens with an article by Cerise on " The Influences of the Mind on the Body, and of the Body on the Mind." We would say today that he is broaching squarely the very problem of psychosomatic medicine. " The influence of the Mind on the Body means, as I see it, the action exercised on the organism by ideas; more especially those ideas which, seeking to obtain satisfaction, come into direct contact with the cravings, needs, and feelings. . . . The influence of the Body on the Mind means, as I see it, the action exercised on the ideas by the general conditions of the organism; more especially those conditions which, in the form of cravings, needs, and feelings, come into direct contact with the idea of obtaining a satisfaction."

To Lélut (1804-1877), we owe the second article, entitled, " On the seat of the soul, according to the Ancients," a historical essay dealing with the psychological knowledge of the Greeks. There follows an interesting article by Longet on the " Pathological Facts which may serve to determine the place of origin and the method of decussation of the optic nerves." His conclusions, even with our present knowledge of anatomy, are still valid today.

There follows an essay by Baillarger on Stupidity. Georget had previously described, under this heading, certain hebephrenic and catatonic forms of schizophrenia. Baillarger completes this description, adding the following conclusions:

1) Those insane who may be said to come under the heading of Stupid are, in many cases, stupid only in appearance; a condition caused by a deeply-rooted delirium, of which they may become fully aware after their cure.

2) This disturbance is almost always of an exclusively depressive character, and is frequently accompanied by suicidal tendencies.

3) Chief among the characteristics of the stupid insane are a disturbance of the sensations, and frequent delusions which throw them into a world of fantasy.

4) It often appears that stupidity is only an extreme degree of a certain form of melancholy.

5) The state of the stupid insane offers, to a great extent, many analogies with the dream-state.

Moreau de Tours then follows with an account of his journey of inspection into the insane asylums of the Middle East; their condition is a most imperfect one. He develops several interesting ideas on the reasons for the wide prevalence of insanity in those regions.

Michéa (1815-1882), later to become an enthusiastic contributor to the *Annales*, gives us a significant essay on the " Psycho-physiological doctrines of the Ancients, considered in their relation to theories of mental derangement."

Ramon de Sagra follows with a statistical table on the insane and deaf-mutes in the United States.

P. N. Gerdy is the author of a treatise on the " Origin and development of the faculties and phenomena of the Intelligence," a chapter of the book he published in 1856 under the title of *La Physiologie philosophique de l'Intelligence*. The special interest of these studies lies in the fact that Gerdy is one of the first to take into account the genetic aspect in psychology.

This first volume of the *Annales* closes with a masterly article by Maurice Macario (1811-1898), on demonomania, a disease which, he points out, was not only prevalent in the Middle Ages, but is still of common occurrence.

In addition to the material outlined above, this issue contains reports on medico-legal cases, original observations on certain forms of mental disease, and finally a complete bibliography.

Thus we have summarized, most briefly, the first volume of this journal. Baillarger thought, when he undertook its publication, that he was embarking on an unimportant task; thanks to his perseverance and that of his followers, the *Annales* have become our chief source for the study of nineteenth century psychiatry. Those with leisure at their disposal will find both pleasure and profit in perusing the first few volumes. Here they will find that ideas and opinions which we today often regard as our own were the subject of discussion a century ago. Let this serve to remind us not to underestimate the labors of our forefathers.

THE SPELLING OF PROPER NAMES, OR THE IMPORTANCE OF BEING ERNEST

HENRY E. SIGERIST

Every historian and bibliographer knows how difficult it often is to ascertain a man's correct name. In Europe, before the 19th century the spelling of family names was not rigidly fixed. They were written phonetically, and since the same sounds could be expressed in different ways, the spelling often varied a great deal. I once published a letter written in 1766 by a Swiss physician whose name occurs as Aepli, Aeppli and Eppli. Since the family still flourishes and today writes its name Aepli, my doctor is usually found in the literature as Johann Melchior Aepli, but in the letter I published he spelled his name Eppli.

It frequently happened that a man changed his name deliberately. Napoleon's family name was Buonaparte and he changed it into Bonaparte that sounded less Italian, a spelling that was generally accepted although not immediately. His aristocratic enemies liked to call him Buonaparte in order to recall his humble origin.

In the case of famous men of the past a definite spelling has been established and today nobody would think of spelling Shakespeare in any but the customary way. But in the case of minor deities it is often very difficult to decide which spelling should be accepted and confusions are unavoidable.

In the 19th century most European countries required individuals to be registered with the authorities, not only at the moment of birth and death, but whenever they established a new residence, and everybody carried a load of official documents identifying himself. Names were frozen and could not be changed without special authorization which, unlike in America, was and still is difficult to obtain.

This made the task of the historian and bibliographer much easier, but even today confusions occur very frequently, chiefly as the result of carelessness. It is almost unbelievable how many people are unable to copy a name correctly, and once a mistake gets into print or into an official document it is difficult to eradicate.

Being interested in the sources of such mistakes, I watched the misspellings of my own name and the following story, I am sure, could be duplicated by every one of my colleagues.

My family name comes from the Latin *sacristanus*, the sexton in the church. In upper Italian dialects the ending was dropped and the word became *sacrista*. It penetrated into the allemanic German of Switzerland and south Germany where it became *Sigrist*, the word still used to designate the sexton. The pronunciation however varied. The first i was sometimes long, sometimes short and the word was sometimes pronounced in two, sometimes in three syllables. As a family name it was therefore spelled Siegrist, Siegerist, Sigrist or Sigerist. Since in Switzerland most families of this name spell it Siegrist, my name was very frequently misspelled in that country. More than once I had to have an official document rewritten because the clerk was unable to copy the name correctly, and whenever I published a paper in a Swiss journal I was pretty sure that I would have to correct the name on the galleys. I have no doubt that Professor Samuel Eliot Morison of Harvard has the same difficulty in keeping the second r out of his name. Outside of Switzerland, where my name is not frequent, there is no reason for its being misspelled.

My book *Einführung in die Medizin* was first translated into Swedish. When I received copies I saw that my name appeared on the cover and on the title-page as Henry M. Sigerist. My German publisher protested and the Swedish publisher very obligingly had a new title-page and a new cover made, but a good number of copies had already been sold and Swedish librarians will have to find out what M stands for.

Two years later, in 1933, a Dutch translation of the same book was published in Holland. It was prepared by my colleague and friend J. G. de Lint. On the title-page my name was H. E. Sigerist but in the index of the book I was listed as: Sigerist, Henry Eduard.

Again a few years later, in 1936, the same book was translated into Chinese. There my name appeared in beautiful Chinese characters, but since it is almost impossible to identify a European name from Chinese characters the publisher had added my name in Latin type and there I became Henry S. Sigerist.

My middle name is Ernest. I was born and brought up in France and on my birth certificate my middle name was spelled in the French way, Ernest. Thus it remained ever since, for over half a century. Whether I lived in France, Switzerland, Germany, England or America my middle name still was Ernest. I was therefore very puzzled when I noticed that in America I was frequently and sometimes in very formal documents addressed as Henry Ernst Sigerist, with my middle name spelled in the German way, and I often wondered what the source of this misspelling was. *Who's Who* and other biographical dictionaries list my name correctly. Their entries are based on questionnaires and galley proofs are usually submitted to the persons involved so that their data are fairly reliable.

At last I found that the source for the misspelling of my middle name was the Catalogue of the Library of Congress where I appear on the printed cards as Henry Ernst Sigerist, and the fact that these cards are widely distributed in America explains the frequent misspelling. The Library of Congress does not attempt to ascertain an author's correct name. The arbitrary rule is "give forenames in the form most common in the author's native or adopted language, or in doubtful cases, in the form proper to the language in which he has written most of his works." [1] My first books were written in Switzerland and published in Germany. Hence I became Ernst and although my native language was French and my adopted language is English, and although by now the majority of my works have been written in English I am and shall remain Ernst—to the Library of Congress.

More complications arise when a name has to be transcribed into a foreign alphabet. The first time I went to Russia my name was entered into the visa as Сайгерист (Saigerist) because the clerk at the consulate assumed that in English i was always pronounced that way. The second time I became Зигерист (Zigerist) and the third time I put a slip into my passport indicating the pronunciation of the name by transcribing it myself. I am afraid I must have caused some trouble to the Commissariat of Internal Affairs but, efficient as they are, they undoubtedly made cross-references.

[1] American Library Association, *Catalog Rules, Author and Title Entries.* Chicago, American Library Association, 1941, p. 43.

Personally I have no feeling in the matter because I really do not care what people call me. If for some unknown reason the Library of Congress chose to list me as Genri Ernestovich Sigerist or as Abu Erica Ibn Ernest Henry Sigerist el-Barizin, I would not have the slightest objection. The example, however, shows that it is sometimes difficult to ascertain a man's correct name and that such seemingly authoritative sources as the Catalogue of the Library of Congress are anything but reliable in this matter and must be used cautiously and critically.

MEDICO-HISTORICAL NEWS AND ACTIVITIES

AMERICAN ASSOCIATION OF THE HISTORY OF MEDICINE

On January 1, 1944 the newly elected officers of the Association will assume their duties. Please make a note of their addresses. They are:

President.....Dr. Edward B. Krumbhaar
McManes Laboratory of Pathology
University of Pennsylvania
School of Medicine
Philadelphia, Pa.

Vice-president....Dr. Richard H. Shryock
University of Pennsylvania
208 College Hall
Philadelphia, Pa.

Secretary.....Dr. W. B. McDaniel, 2d
19 S. 22nd St.
Philadelphia, Pa.

Treasurer..... Dr. William G. Leaman, Jr.
3700 Baring Street
Philadelphia, Pa.

Dr. Sigerist remains Editor of the Association, and communications concerning the *Bulletin of the History of Medicine* are to be addressed as before to 1900 E. Monument St., Baltimore 5, Md.

Miss Genevieve Miller remains in charge of the *Bibliography of the History of Medicine of the United States and Canada*, and communications concerning the Bibliography are to be addressed to 1900 E. Monument St., Baltimore 5, Md. as before.

A list of members of the Association brought up to date to January 1, 1944 will be published in the January 1944 number of the *Bulletin*.

Student essays for the *William Osler Medal Contest* are to be sent before June 1, 1944 to Dr. Sigerist, who will submit them to the Committee on Medals.

CONSTITUENT SOCIETIES

The Johns Hopkins Medical History Club, Baltimore, Md.

On November 1, 1943 the Johns Hopkins Medical History Club opened its fifty-fourth year with a meeting in honor of the 400th Anniversary of the publication of Vesalius' *De humani corporis fabrica libri septem.* The following program was presented, with Dr. George W. Corner as Chairman:

Andreas Vesalius in the History of Anatomy: Dr. George W. Corner.
Psychological Sidelights on Andreas Vesalius: Dr. Gregory Zilboorg.

Andreas Vesalius, the Humanist: Dr. Ludwig Edelstein.
Some Aspects of the Anatomical Material of Vesalius:
Dr. William L. Straus, Jr. and Dr. Owsei Temkin.
Albanus Torinus and the German Edition of the *Epitome*:
Dr. Henry E. Sigerist.

An Exhibit illustrating the life and work of Vesalius was displayed in the Exhibition Hall of the Institute of the History of Medicine.

NATIONAL NEWS

California.

A meeting in honor of the 400th anniversary of the publication of Vesalius' *De humani corporis fabrica libri septem* was held by the California Academy of Sciences on October 6, 1943. It took place at the University of California Medical Center in San Francisco. Dr. J. B. deC. M. Saunders, chairman of the department of anatomy, gave the principal address on "Andreas Vesalius, the Anatomist."

Connecticut.

An impressive *Vesalius celebration* was held at the Historical Library of Yale University School of Medicine on October 30, 1943. Dr. W. W. Francis was the presiding officer of the meeting at which the following papers were read:

The Philosophical Character of Science in the Renaissance:
Ernst A. Cassirer.
Vesalius at the University of Paris: Edward Clark Streeter.
Oporinus and the Publication of the *Fabrica*: Carl Purington Rollins.
The Attack of Puteus on Vesalius and the Defense by Cuneus:
Arturo Castiglioni.

The Benediction was pronounced by Reverend George Stewart. In connection with the meeting, a selection of books and memorabilia from Dr. Harvey Cushing's rich collection of Vesaliana was on display in the Rotunda of the Medical Library.

Illinois.

The *D. J. Davis Lectureship on Medical History* has been established at the University of Illinois College of Medicine by friends and colleagues of Dr. Davis who retired this year as dean of the College. The first lecture was held on October 15, 1943 by Jens Christian Bay, Librarian of the John Crerar Library, who spoke on "A Prelude to Medical History."

Michigan.

The "Early House" on Mackinac Island in which William Beaumont

performed many of his famous experiments on Alexis St. Martin in his studies on the gastric juice has been transferred to public ownership. A permanent memorial to Beaumont will be established.

NEWS FROM LATIN AMERICA

Argentina.

Recently received is *Revista Argentina de Historia de la Medicina*, Año II, No. III, September 1943. The following historical papers are included:

Nicanor Palacios Costa: Semblanza de Cosme Argerich.

Juan Ramon Beltran: Síntesis histórica de la epidemiología en la Argentina.

Eustaquio Duarte: Orígenes de la fiebre amarilla en el Brasil.

Mexico.

On October 26, 1943 a bust of Claude Bernard was unveiled in the Library of the Department of Physiology of the Universidad Nacional de México. The bust was designed and executed by Doctor J. G. Martín del Campo. Presiding at the exercises was the Rector of the University, Lic. Rodulfo Brito Foucher. The other speakers were Dr. J. Joaquín Izquierdo, Head of the Department of Physiology, and Dr. Paul Rivet of the French Committee of National Liberation.

NEWS FROM EUROPE

England.

Word was recently received of the death of C. J. S. Thompson, Ph. D., honorary curator since 1927 of the historical section of the museum of the Royal College of Surgeons. He was born in 1862, studied chemistry and pharmacy, and soon became interested in their historical aspects. From 1900 to 1926 he was curator of the Wellcome Historical Medical Museum. His historical writings include *The Mystery and Romance of Alchemy and Pharmacy* (1897), *Poison Romance and Poison Mysteries* (1899), *Quacks of Old London* (1928), *The Mystery and Art of the Apothecary* (1929), *and The History and Evolution of Surgical Instruments* (1942).

Switzerland.

The *Swiss Society for the History of Medicine and Science* held its Annual Meeting at Schaffhausen on August 28 and 29, 1943. The following papers were presented:

W. Meier (Zürich): Soziologische Grundlagen zur Naturforschung Zürichs im 16. Jahrhundert.

R. von Fellenberg (Bern): Eine Vorlesung über den Kaiserschnitt vom Anfang des 19. Jahrhunderts.

J. Schneider (Altstätten): Das geschichtliche Alter des Schaffhauser Paläolithikums nach Nuesch, Spitaler, Milankowitsch, Nipkow.

E. Goldschmidt: Ueber Lepra.

G. Senn (Basle): Der Rebbau im antiken Griechenland.

E. Wölfflin (Basle): Einiges aus der Praxis von Galen.

H. Erhard: Gab es schon im Altertum eine Abstammungslehre?

B. Milt (Zürich): Medizinische Kostbarkeiten der Stadtbibliothek Schaffhausen.

B. Peyer (Zürich). Bildnis und Siegel des Anatomen Johann Konrad Peyer.

H. Fischer (Zürich). Aus dem Leben Johann Conrad Fischers (1773-1854).

Directly after the meeting the Society witnessed the opening of a new division of the Museum zu Allerheiligen devoted to old Schaffhausen industries and technology and a new room for astronomy in the Naturhistorische Museum. Several exhibits were prepared for the occasion: a demonstration of plant and animal pictures from illustrated books in the Museum zu Allerheiligen, and a collection of works by professors of the Schaffhausen Medical School of the 17th century and other outstanding local physicians.

Editor's Note

In order to comply with government regulations concerning the curtailment of paper, the Bulletin of the History of Medicine has reduced its edition by 10 per cent. This has the disadvantage that our stock of back numbers will be reduced considerably, but it will enable us not to reduce the number of pages published. In view of the fact that the Bulletin is at the moment the only scholarly periodical devoted to the history of medicine in the whole English speaking world that is published regularly, this seemed the more appropriate way of saving paper.

M. F. Ashley Montagu. *Edward Tyson, M. D., F. R. S., 1650-1708, and the Rise of Human and Comparative Anatomy in England.* Memoirs of the American Philosophical Society, Vol. XX. Philadelphia: The American Philosophical Society, 1943. 488 pp. Illustrated. $5.00.

Historians of science and medicine have for one reason or another failed to give proper recognition to the importance of Edward Tyson. Professor Montagu's solid contribution rights this injustice with such a wealth of evidence that it is quite unlikely that the case will ever have to be pleaded again.

Tyson's life fell in the period when the "new science" was making astounding progress in England and the continent. His intimate connection with the Royal Society makes it inevitable that the activities of that Society and of men like Aston, Plot, Grew, Hooke, Cowper, and Ray should form a background of this biography.

Professor Montagu has painstakingly tracked down every scrap of evidence about Tyson, as anatomist, clinician, pathologist, hospital administrator, and teacher. The material is examined in relation to the scientific and cultural history of the period, so that we really have here something far more substantial than the usual biography.

The author's great enthusiasm for his subject is everywhere in evidence and can hardly fail to communicate itself to the reader. The latter will therefore readily forgive some repetitiousness; and even if he cannot agree that Tyson is to be classed with Copernicus, Vesalius, and Newton, he will not be inclined to be too critical.

For there is no question that Tyson must be put in the very forefront in any history of comparative anatomy, and it is this phase of his activity which chiefly interests the author, the keystone of the biography being Tyson's classic work on the chimpanzee, *Orang-Outang sive Homo Sylvestris: or, The Anatomy of a Pygmie compared with that of a Monkey, an Ape, and a Man*, London, 1699.

Philologists and folklorists will be particularly interested in Tyson's *Philological Essay concerning the Pygmies, the Cynocephali, the Satyrs, and the Sphinges of the Ancients.* For this essay is a masterpiece of literary and cultural historiography despite what subsequent discoveries have shown to be an erroneous conclusion.

Readers of this periodical will perhaps be most familiar with Tyson as the discoverer of "Tyson's glands"; they will be interested to read of his innovations in the teaching of anatomy, and, in connection with the supervisorship of Bethlehem Hospital, his reforms in hospital administration and in the treatment of the mentally sick.

In a carefully considered chapter on Tyson's influence the author takes up again the various fields of Tyson's activity and draws on a wealth of illustration from literature, both scientific and general, to measure Tyson's importance. There is also, in this connection, a Foreword by Professor George Sarton who makes some interesting observations on the history of evolutionary theory and of Tyson's place in this development.

Altogether the book is a distinguished contribution to the history of science and is all the more welcome at a time when it is becoming increasingly difficult to publish such works.

I. E. DRABKIN.

CHARLES E. RAVEN, D. D. *John Ray, Naturalist; His Life and Works.* Cambridge: The University Press, 1942, xix + 502 pp. $7.00.

John Ray was one of the great English figures of the 17th century who, wearying of scholastic and religious debate, turned to the natural world to find therein fresh studies and the revealed greatness of the Creator. By prodigious labor, aided with keen powers of observation and a critical judgment, Ray brought order into the confusion of plant and animal species, developed sound natural systems of classification, and so laid the foundations for the biological sciences. Yet no careful study of the man and his work has hitherto existed, nothing except brief inadequate accounts such as the 18th century Life by Derham, reprinted for the Ray Society in 1846.[1] The neglect may be attributed to general ignorance of the works of Ray, who wrote in the Latin medium of his religious education, and to the overshadowing eminence of Linnaeus in the following century. Charles Raven has at last supplied the needed study. Raven, himself both an able naturalist and an ardent churchman calling for a union of religion and science,[2] enthusiastically traces the details of this life, travels, and writings of his subject who considered the ministry his vocation (Ray was ordained in 1660) but came to make biology his life work.

The study is exhaustive. Raven states in the Preface (p. xi) that "if the work was worth doing, it was worth doing thoroughly and objectively." It is certainly thorough. Raven studied all available records, correcting several previously accepted errors in the details of Ray's life. He read through all of Ray's voluminous writings and correspondence and even walked in many of the localities where Ray had made his observations. But the book may not be altogether objective. The author seeks to refute criticism that has detracted from the renown of Ray and to amass evidence proving that Ray was more than a mere compiler, which was the condescending

[1] *Memorials of John Ray*, edited by E. Lankester, London, 1846.

[2] See C. E. Raven, *Science, Religion, and the Future*, Cambridge, The University Press, 1943.

judgment of Linnaeus and several lesser naturalists such as Robert Morison, physician and botanist in the court of Charles II. Raven shows in detailed chapters on the botanical works, the *Methodus Plantarum*, the *Historia Plantarum*, and others, that Ray collected material and made critical observations with remarkable insight for greater ends than mere compilation. He was interested in function as well as in form, conducting experiments, for example, in the motion of plant sap. Raven emphasizes that Ray did not regard classification as an end in itself, as did Linnaeus, but considered it only a convenience providing a necessary foundation upon which to build a more complete understanding of plants. In Raven's judgment of the two great botanists "there can be no sort of doubt that Ray had the truer appreciation of the real task of a scientist" (p. 306).

It was to Ray's disadvantage that unlike Linnaeus he held no university post but worked inconspicuously alone with the patronage of Francis Willughby, a wealthy naturalist who planned studies in zoology to parallel the botanical researches of his friend. Willughby, dying young having published nothing, left Ray a small annuity and bequeathed to him his notes on insects, fishes, birds, and mammals. During the last thirty years of his life Ray added much of his own work to these notes and published the resulting studies in Willughby's name. How much of the value of these zoological studies should be assigned to Ray rather than to Willughby, to whom great credit has generally been given, is a difficult question. In chapters devoted to these books, the *Ornithologia*, the *Historia Piscium*, and the *Historia Insectorum*, Raven gives evidence to show that the best part of them is Ray's work, *e.g.*, in the *Ornithologia* the classification of birds (p. 324) and the most valuable part of the *Historia Insectorum*, the studies of Lepidoptera (p. 390). The *Historia Piscium* is judged, after a lengthy review of the evidence, to be almost entirely Ray's work (p. 352). But since we have nothing printed by Willughby himself by which to estimate him, Raven perhaps goes too far when he concludes that, in comparison with Ray, Willughby appears to have been merely a "talented amateur" (p. 336). The question cannot be answered definitively, but at least Raven has unearthed a great deal of evidence in favor of Ray, who seems to have been an extremely modest man and too partial toward his benefactor and friend to claim all the credit due to himself.

The book is well annotated and includes both a general index and two additional indices on the flora and fauna mentioned in the analyses of Ray's writings. There is no separate bibliography, however, which would be a valuable collection of the many authors and publications to which Raven abundantly refers throughout the footnotes. An epitome of Ray's life printed in the Introduction is useful both as a summary and as a guide through the mass of detailed studies.

GEORGE RAYNOR THOMPSON.

CHARLES-EDWARD A. WINSLOW. *The Conquest of Epidemic Disease.* Princeton: Princeton University Press, 1943. 424 pp. $4.50.

The history of epidemiological theory is one of the most interesting aspects of medical history, dealing as it does with the efforts of man to explain and to understand the nature of one of his worst foes, epidemic disease. A connected presentation of this subject in English has hitherto been lacking. The present volume is an attempt to supply this lack. Dr. Winslow regards his subject as a chapter in the history of human ideas. Consequently he has centered his attention on the three concepts which he considers as having dominated the problem of the causation of epidemic disease, that is, demons, miasms, and germs. Beginning with the ideas of primitive and protohistoric peoples, the author traces, as far as possible in the actual words of the various participants, the progressive development of epidemiological thinking, concluding his story with the firm establishment of the germ theory of disease. Dr. Winslow analyses in great detail and with the aid of copious quotations the medieval Plague Tractates, the works of Fracastoro, Athanasius Kircher, Thomas Sydenham, Richard Mead, Benjamin Rush, Noah Webster, Edwin Chadwick, John Snow, William Budd, Max von Pettenkofer and his school, Pasteur, and of numerous others who have contributed in greater or lesser degree to the structure of modern epidemiology. The inclusion of the extensive citations from some of the lesser known or more inaccessible sources undoubtedly enhances the value of the book.

Nevertheless, despite the very definite contributions to medical history represented by this volume, attention must be called to certain shortcomings. The first of these is the inadequate treatment of primitive ideas of disease. According to Dr. Winslow, "it is clear that the overwhelming majority of [the human] race have held the belief that disease is caused by the malign influence of individual and supernatural powers." This he terms the "Demonic Theory of Disease" (page 3). Again on page 6 we learn that "Among all primitive tribes known to the ethnologist, the demonic theory of disease is the prevailing one."

Exception must be taken to these statements. In the first place, to lump all primitive concepts of disease under the single heading of "demonic" is certainly not adequate to deal with the available evidence. Such a category is far too broad to throw any real light on the nature of primitive ideas of disease, and does not permit the reader to obtain any real understanding of primitive thought on this subject. A classification such as that presented by Clements (Forrest E. Clements: *Primitive Concepts of Disease*, Berkeley, California, 1932), namely, disease as due to (1) *natural causes*, (2) *human agency*, i. e., disease considered directly due to the malefic action of some human being, and (3) *supernatural agency*, i. e., sickness regarded as due to the action of supernatural factors; and the further narrowing down of these categories into five main types: (1) sorcery, (2) breach of taboo,

(3) disease-object intrusion, (4) spirit intrusion, and (5) soul loss, would certainly have shown the reader that there is more to primitive thought on the nature of disease than a single "demonic" theory. The author does indicate that such differentiations exist, but he does not clarify the relations between them. Furthermore, he underestimates the degree to which primitive peoples recognize natural causation in disease. For example, the African Pondo recognizes naturally caused diseases and the infectiousness of certain illnesses. They have two types of practitioners, diviners and herbalists, the former to treat disease caused by witchcraft, the later to treat natural disease (see Monica Hunter: *Reaction to Conquest*, Oxford University Press, 1936). This is also true of other peoples.

This brings us to the second objection concerning the section on primitive medicine. Despite the author's generalization about "all primitive tribes known to the ethnologist," his bibliography does not indicate that he consulted any of the excellent recent studies of primitive medicine, such as those contained in the works of Fortune, Evans-Pritchard, Harley, Field, Spencer, Hunter, and Redfield.

On page 11 Dr. Winslow sets forth another debatable generalization. He says: "It appears that in India, in Egypt, as well as among the Jews and the Christians, an early phase of emphasis on broad moral principles and universal law degenerated into a later phase of animism." This generalization is not advanced on the basis of any evidence and it is difficult to see how the author arrived at it. Furthermore, when this alleged degeneration is explained by the statement that "in each of these great civilizations the early vision of a universe of moral law and natural law was too severe a challenge to the halting human spirit," one is tempted to quote Veblen's remarks on the explanatory use of such spiritual agencies by historians. "There is no call," says Veblen, "to undervalue these occult agencies, of course; but granting that these and their like are the hidden springs, it is also to be called to mind that it is their nature to remain hidden, and that the tangible agencies through which these presumed hidden prime movers work must therefore be sufficient for the work without recourse to the hidden spring; which can have an effect only by force of a magical efficacy."

In general Dr. Winslow tends to disregard the social and cultural roots of the ideas with which he deals. To be sure, the concepts of medicine derive to a very considerable degree from antecedent and contemporary *medical* factors, and they can be traced within such a limited framework. While acknowledging this, however, it must not be overlooked that medical ideas are also greatly influenced by social and economic forces. Thus, in considering Greek ideas of disease, Dr. Winslow overlooks L. Edelstein's significant study of the Hippocratic treatise "Airs, Waters and Places." He attributes an important role to Greek philosophy, but does not indicate the connection between the ideas of nature developed by the Greeks and the social

and political world in which they lived. The same approach is also evidenced in the discussion of the miasmatic theory and its upholders in the 19th century. For instance, there is no attempt made to determine to what extent British commercial and imperial interests influenced the anti-contagionist views of British physicians. I am not suggesting that men like Murchison or Sutherland (the latter is unmentioned in the present volume) consciously allowed themselves to be influenced by prevailing commercial interests. It is obvious, however, that as a great commercial nation, England found any obstacle to the free movement of trade very much to the disadvantage of her interests. Unless environmental influences are taken into account and investigated it is not possible to arrive at a complete understanding of the views of the English miasmatists. Indeed, very definite opposition to contagionism and quarantine on such grounds is expressed by certain medical writers, for instance, Charles Maclean in his *Evils of Quarantine Laws and the Non-Existence of Pestilential Contagions*, London, 1825.

Another shortcoming of Dr. Winslow's volume is the fact that in his treatment of the 19th century he has restricted himself too much to British sources. He makes very little use of continental sources. While he devotes an entire chapter to Rush and Webster, whom he uses to illustrate epidemiological thought at the end of the 18th century, there is no mention even of such a man as the Austrian, Franz von Schraud whose *Vorschriften der inländischem Polizey gegen die Pest und das gelbe Fieber* (Vienna 1805) is equally illustrative of the general position on the European continent at this time. Nor does Dr. Winslow use such an important source of information as the transactions of the various international sanitary conferences held during the 19th century. While he mentions the epidemiological writings of certain French doctors, they are discussed briefly. Others, such as Sulpice-Antoine Fauvel, who gave an accurate analysis of the epidemiology of cholera in 1866, eighteen years before Koch's discovery, are not even mentioned. In discussing Henle's essay on miasmata and contagia, Dr. Winslow forgets to point out that it was Henle who first laid down the principles later known as Koch's postulates.

In addition to the aforementioned criticisms attention must also be called to several minor errors, misstatements, and omissions. On page 77 "the Susruta" is cited. This should either be "Susruta," who was an Indian physician, or "the Susruta Samhita" which is the collection of his works. On page 92 the name of "Rabbi Akibi" should be "Rabbi Akiba." On page 125 the date *1796* for the introduction of treatment by mercury is certainly erroneous. On page 126 after completing a discussion of Paracelsus and his views, the author goes on to discuss the ideas of Fracastoro. Introducing his subject, he says: "With him, too, we pass from the world of legendary names associated with scattered literary fragments to a human being with known history and clearly envisioned personality." On reading this state-

ment one wonders whether it is meant to apply to Paracelsus whose works in Sudhoff's edition were published in 15 volumes. Finally, in connection with the chapter on the insect vector I wish to point out that Dr. Winslow omits any mention of several pioneer proponents of the idea of insect transmission of disease, namely, Lancisi, in Italy, Josiah C. Nott, of Mobile, Alabama, and Louis D. Beauperthuy, of Guadeloupe. According to Hirsch, Lancisi, in 1717 almost guessed the truth about malaria transmission. Nott in 1848 suggested that the specific cause of yellow fever might be found to exist in some form of insect life; and Beauperthuy in 1853 stated definitely that he regarded the mosquito as the source of yellow fever in man.

From the preceding discussion it is evident that while Winslow's book is a useful contribution, it has a number of limitations and defects. One might perhaps have wished that the author had given the book a broader historical background, but the reader will learn much about the history of ideas on epidemic disease.

GEORGE ROSEN.

A. K. BOWMAN. *The Life and Teaching of Sir William Macewen; A Chapter in the History of Surgery.* London, Edinburgh, Glasgow: William Hodge and Company, 1942. x + 425 pp. 21 shillings.

William Macewen was born on the island of Bute in 1848 the son of a trader. About 1860 the family moved to Glasgow and Macewen's life remained closely connected with this city. It was here that he studied medicine (while Lister was professor of surgery!), was affiliated with the Royal Infirmary until 1892, the year in which he became Regius Professor of Surgery at the University of Glasgow, and here too he died in 1924. In 1889, Macewen was invited to take over the Professorship of Surgery at the Johns Hopkins University and came very near accepting the call as we are told on the authority of Dr. Finney (p. 311). During the last World War he served as Surgeon General in Scotland for the senior service of the Navy. Honorary degrees, honorary memberships in professional associations, travels which led him to this country and even as far as Australia marked a life full of success and achievement.

Of Macewen's achievements, his operation for genu valgum and above all his epoch making work on cerebral infections from the ear are probably best known. Dr. Bowman's biography, however, makes it abundantly clear that these were only a few items in an impressive list of surgical researches and operative triumphs. Almost every field of surgery, from antisepsis—which he very early helped to transform into asepsis—to the medical cure of herniae and carcinoma, owes him an important advance or at least a stimulating new idea. The various phases of Macewen's work, too numerous even to be men-

tioned here, are dealt with thoroughly in the framework of the biographical account.

One outstanding weakness of Dr. Bowman's book, in my opinion, is the continuous eulogy paid to his hero. No reader will doubt that Macewen was a very great surgeon and an impressive personality. The facts as well as anecdotes which the book relates put this beyond dispute. But why not let the record speak for itself? By continually underlining and praising Macewen's merits, Dr. Bowman weakens rather than strengthens his case and makes his book less lively reading than it could have been.

There are also a number of historical slips. Galen was very well acquainted with healing of wounds by "first intention," a term which he himself used.[1] Consequently, to consider wound healing as a problem of inflammation was hardly a Galenic idea, not even essentially so as suggested on p. 39. Regarding Germany and Denmark, it is not correct to say that "to all intents and purposes, the surgical technique of these nations became antiseptic between the years 1868 and 1870" (p. 56). As far as Germany is concerned this was hardly the case before the period of 1872-1875. Rickets did exist in antiquity as is indicated by Soranus in the 2nd century A. D.[2] contrary to the assumption "that it first manifested itself at no very remote period" (p. 171). Helmholtz introduced the ophthalmoscope in 1851 and not in 1849 (p. 254), and the idea of the "unity of the brain function" had been shaken by Gall and Spurzheim more than half a century before Broca (cf. p. 255). The list might be enlarged by a few items. But these slips are only the by-product of an otherwise excellent endeavor. Not content with describing Macewen's own achievements, the author places them in their historical background. For instance, Macewen's praise of Bichat gives an opportunity to devote a few pages to the latter; discussing Macewen's work on aneurysm, Bowman makes a digression on Hunter. The biography thereby gains in value and deserves its subtitle: "A Chapter in the History of Surgery."

O. Temkin.

Edgar Erskine Hume. *Victories of Army Medicine: Scientific Accomplishments of the Medical Department of the United States Army.* Philadelphia: J. B. Lippincott Company, 1943. xiv + 250 pp. Illustrated. $3.00.

Colonel Edgar Erskine Hume, at present with the Fifth Army in Italy, has added a new book to his long list of publications on the history of the

[1] Cf. Galen, *Ars medica*, chs. 29 and 30 (ed. Kühn, vol. I, pp. 385 ff.).

[2] Cf. Soranus, *Gynaecia* II, ch. 20 (ed. Ilberg, p. 85). Cf. also John Ruhräh, *Pediatrics of the Past*, New York, 1925, pp. 4-5.

Army Medical Corps. As the subtitle states, this book discusses the scientific accomplishments of the Medical Department of the United States Army.

Beginning with a brief history of the organization, personnel and function of the Medical Department from 1775 to the present time, Hume next discusses the three great institutions it created: the Army Medical Library which Surgeon General Joseph Lovell, the friend of Beaumont, began in 1836 and which was developed extensively by John Shaw Billings with funds left over from hospital funds of the Civil War; the Army Medical Museum, the largest in the world; and the Army Medical School founded in 1893 by Surgeon General Sternberg, the oldest school of preventive medicine in the world.

The next three chapters are devoted to non-medical scientific activities of members of the Medical Department, such as meteorology, anthropology and ethnology, and ornithology. In 1814 James Tilton, Surgeon General during the War of 1812, directed the hospital surgeons to record the weather at their various posts, a function that they performed continuously until 1890 when the Weather Bureau was founded. Their studies in anthropology and ornithology resulted from the happy combination of scientifically curious and alert individuals being placed in localities rich in new material such as the West and the Philippines.

Colonel Hume continued by discussing the medical progress achieved by members of the Army: advances in surgery, Walter Reed's work on yellow fever and typhoid, William Beaumont's study of the physiology of digestion; followed by four chapters on advances in medical knowledge and technique connected with our four major wars. These chapters include a vast number of subjects as diversified as ventilation and venereal disease control or the study of the human foot and its proper shoe. Especially interesting today are the notes on recent work on aviation medicine, defense against gases, and the brilliant work of the Army Medical Corps at Pearl Harbor. Headed by Colonel Edgar King (now Brigadier-General) the medical staff was fully prepared for any emergency, and through the planning and foresight in the organization of medical squads and the provision of adequate supplies, was able to reduce greatly the extent of the catastrophe.

The work done by the Dental and Veterinary Corps, as well as the Army Nurse Corps, is also discussed. The final chapter is a miscellany of various facts including a section on medical officers who became chiefs of other branches of the Army, those who were professors at universities, various priorities of the Medical Corps, and complete lists of chiefs of the Medical Department of the Army, Librarians of the Army Medical Library, Curators of the Army Medical Museum, U. S. Army General Hospitals, etc.

Obviously in a book of this type which contains brief outlines of a great number of activities, there is some repetition and considerable overlapping. It in no way intends to present a continuous and detailed history of the Medical Department of the Army, but to bring into focus the separate

achievements of the Corps and its individuals. Nothing is treated in great detail, but in almost every case an exact reference is made to the original publication so that the reader who is interested in going farther may do so, aided also by a useful list of references for each chapter.

There are a few small points in the book over which one could quibble, such as including Benjamin Waterhouse's introduction of vaccination into the United States in 1800 as an achievement of the Medical Corps, for Waterhouse did not even join the Army until the War of 1812. The author himself states in his preface that he confined himself "to the work supervised or individually done by career medical officers." The same could apply to Benjamin Rush who, although he was Physician General in the Revolutionary War, was in no sense a career officer. Hume also slips in assigning the opening date of the Johns Hopkins Hospital to 1891 instead of 1889; but these are minor details that occur so infrequently that they do not detract from the whole. Numerous illustrations which consist mainly of portraits, and a good index add a great deal to the attractiveness and value of the book.

GENEVIEVE MILLER.

MAX NEUBURGER. *British Medicine and the Vienna School. Contacts and Parallels.* London: William Heinemann, 1943. 134 pp., 13 plates. 10s. 6d.

Professor Neuburger has written a very charming little book, and in discussing the relations between British medicine and the Vienna School he has paid a graceful tribute to the country that has given him asylum.

The old Vienna School was a daughter of Leyden. When Maria Theresa invited Boerhaave's disciple van Swieten to Vienna in 1745 and when he thereafter called his classmate de Haen and put him in charge of the Vienna General Hospital, the spirit of Boerhaave's clinical teaching became deeply rooted in the imperial city. But Leyden had other daughters, the medical School of Edinburgh first of all, but also Göttingen and far on the periphery, the Russian schools created by Peter the Great.

This common ancestry created a natural bond between Vienna and the schools of other countries. And in those days medicine was still international. The schools had uniform institutions and a common language that permitted the dissemination of knowledge beyond national boundaries without delay.

Vienna with such men as van Swieten, de Haen, Stoll, the Franks, father and son, had a great deal to give to the world. But it also received inspiration particularly from England. Sydenham's clinical approach and his idea of the epidemic constitution still had a strong appeal in the 18th century. No dermatologist could escape Willan's influence. John Brown's theories

found a most fervent advocate in Joseph Frank and Jenner's vaccination was propagated in Austria by de Carro, a Viennese physician trained at Edinburgh.

From Vienna came Gall and Mesmer whose doctrines had wide repercussions particularly in England where mesmerism was disrobed of its magical apparatus and reduced to what it actually was, hypnotism. Auenbrugger's percussion found a late but effective English interpreter in Forbes.

The second Vienna School that flourished toward the middle of the 19th century took its inspiration from Paris and with such men as Rokitansky and Skoda made pathological anatomy and physical diagnostics the foundation of clinical medicine. It also applied the anatomical method with tremendous success to such fields as dermatology, ophthalmology, oto-rhino-laryngology, and Vienna was for many years a world center for post-graduate training in the specialties.

Again the relations with England and British medicine at large were very close and Prof. Neuburger with his encyclopedic knowledge of medical history pictures them in a very attractive way. If one criticism may be permitted, it is that the author could not resist the temptation to pack too many facts between the covers of a small book so that the narrative is sometimes overburdened with names.

The book is handsomely printed and the illustrations are unusually good, much better than those of most of our American books. An index of names would have been welcome in a book that mentions so many names.

Now that Professor Neuburger is investigating the radiations of the Vienna School, it is to be hoped that someday he will devote a book to the Vienna School and American medicine.

HENRY E. SIGERIST